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CLINICAL LECTURES
ON
THE SURGICAL DISEASES OF THE
URINARY ORGANS

BY THE SAME AUTHOR.

THE MODERN TREATMENT OF STONE IN THE BLADDER BY LITHOLAPAXY

(Now Incorporated in this Work).

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'There is no question about the value of this monograph. . . . It will, no doubt, form a standard text-book on the subject.'—*London Medical Record*.

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'We welcome the second edition of this little treatise, and congratulate the author on his extensive and successful series of cases of litholapaxy.'—*Lancet*.

Clinical Lectures

ON

THE SURGICAL DISEASES OF THE URINARY ORGANS

BY

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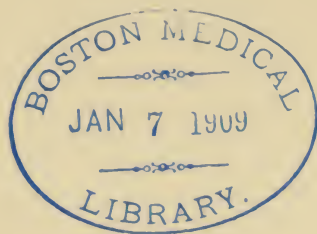
LATE EXAMINER IN SURGERY AT THE DURHAM UNIVERSITY

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PREFACE

THESE lectures have from time to time been delivered at the Medical Graduates' College and Polyclinic, and at St. Peter's Hospital for Urinary Diseases. Many of them have already been published in various medical journals; and those on Enlargement of the Prostate and Stone in the Bladder have run through several editions in monograph form. The lectures have now been amplified, brought up to date, and arranged in convenient order, to comply with the invitation of the Publishers that I should prepare a comprehensive work on the surgery of the urinary organs.

My aim in these lectures has been to give a clear, concise, and practical *résumé* of our most recent knowledge of the subjects dealt with, the methods of treatment advocated being those which in my own practice I have found sound and effective. No principle is here inculcated that has not been fully subjected to the test of my own experience.

A word of explanation is, perhaps, due for retaining in a work of this kind the numerous illustrative cases that appeared in the last edition of my work on the prostate. In doing so I have had a twofold object in view—first, that these cases illustrate in detail many practical points connected with the operation of enucleation of the enlarged

prostate ; and, second, that in the case of a comparatively new operation of this kind, for which I am personally responsible, I have thought it right to place before the reader ample evidence of its practical value.

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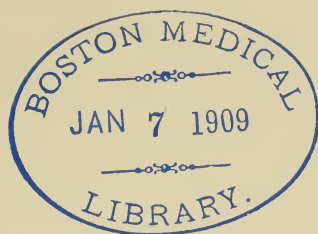
April, 1908

P. J. F.

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LECTURE I

STRICTURE OF THE URETHRA: ITS VARIETIES, PATHOLOGY, SYMPTOMS, SECONDARY RESULTS, AND DIAGNOSIS

GENTLEMEN,

I propose directing your attention to-day to stricture of the urethra. It is one of the most important of the surgical disorders of the genito-urinary organs. It is the most common of those diseases that you are called on to deal with in practice, since at one or other period of life the vast majority of the male population suffers from that condition which most frequently gives rise to it. If neglected or improperly treated, it is most far-reaching in its injurious consequences, through the morbid pathological changes thereby produced.

A detailed description of the anatomy of the urethra would be foreign to the scope of these lectures; but there are certain features in its conformation to which I wish briefly to draw your attention.

The urethra in the adult male is about 8 inches in length. It is commonly divided into three parts—penile, membranous, and prostatic. These two latter, again, constitute the deep or fixed urethra, in contradistinction to the penile or pendulous urethra. This latter is 6 inches long, the membranous portion being $\frac{3}{4}$ inch, and the prostatic $1\frac{1}{4}$ inches. Ultzmann

divides the urethra into 'anterior' and 'posterior,' the triangular ligament being the boundary between them.

It must be remembered that the lengthy urethra in the male, though it acts as a urinary organ, is not essential for this purpose—a tube 1 inch long sufficing for this function in the female. It is, however, necessary for the procreative function—a spermatic conduit, in fact—and is, therefore, essentially a sexual organ.

The urethra may be described as a more or less elastic tube or hose, the inner surfaces of which, in the inactive state, are in contact with each other, being drawn closely together by the muscular and elastic elements in its walls. The surfaces are separated and a true canal temporarily formed during the passage of urine or the emission of semen; and, on the cessation of these functions, the walls close in, the cavity of the urethra being obliterated.

This contractile action of the walls of the canal may readily be demonstrated by the urethroscope. As the metal tube is pushed on the urethral walls are seen to open out, and, on its withdrawal, to contract immediately behind the instrument, the picture presented to the eye being that of a central pit with tiny folds of mucous membrane radiating from it in umbelliferous fashion all round. In the membranous and prostatic portions of the urethra, in addition to the involuntary contraction of the canal, there are certain muscles under voluntary control by which the urethra is still further closed, and by which the last few drops of urine are expelled.

Stricture of the urethra, as its name implies, consists in an abnormal diminution of the calibre of the canal at some particular part; or, as in the quiescent state the urethral walls are in contact and the canal obliterated, perhaps it may be more logically defined as a condition by which the urethra is prevented from dilating to its natural capacity by the force of the urinary stream.

The older writers were in the habit of dividing strictures into three kinds: (1) *Inflammatory*; (2) *spasmodic*; and (3) *organic*.

The former two being of a temporary character, there is a tendency amongst some modern writers, particularly in England, to restrict the term 'stricture' to the third variety, which is of a permanent character. I consider the old classification a convenient one. Any condition of the urethra that causes even temporary retention or obstruction to the flow of urine should not be lightly regarded.

Inflammatory stricture consists in a temporary narrowing of the urethral passage from inflammatory swelling of its walls, partially or wholly obstructing the flow of urine for the time being. It may be due to one of the following causes: (1) Acute specific urethritis; (2) injury to the urethra caused by faulty passage of instruments; (3) swelling of the prostate, due to congestion or inflammation of this gland; and (4) it occurs in connexion with organic stricture, on which, from various causes, it is often superimposed.

Spasmodic stricture is the term applied to temporary contraction of the urethra, due to spasm of the muscular elements in and around its walls. It may manifest its presence in either of two ways—viz., by causing complete retention or diminution of the stream of urine, and by obstructing the passage of instruments into the bladder.

Retention from this cause may occur under the following circumstances: (1) After stretching the sphincter and preliminary to operations in or about the rectum; (2) following vasectomy or castration; (3) after operations on the kidneys; (4) in connexion with catheterization; (5) from injuries to the perineum, the urethra being uninjured; and (6) in patients suffering from organic stricture after exposure to cold and wet, or venereal excesses. Spasmodic contraction, as detected by the passage of an instrument, invariably occurs

in the deep urethra, and is, as a rule, due to reflex irritation of the muscles induced by the presence of an organic stricture of large calibre in the anterior portion of the canal, generally close to the meatus. It is not uncommonly mistaken for organic stricture by the inexperienced surgeon, who fails to discover the real cause—viz., the stricture of wide calibre in the anterior part of the urethra. Reflex spasm impeding the introduction of instruments may also occur when stone or tumour of the bladder is present.

The inflammatory and spasmodic forms of stricture may co-exist, in which case it will be impossible to determine the amount of contraction due to each ; and one or both may be superimposed on the organic variety.

The immediate treatment of retention of urine arising from either of these causes is practically the same. It consists in clearing out the lower bowel at once by an enema, placing the patient in a hot bath, and giving opium by the mouth, or morphia hypodermically. Should these measures not suffice, a soft olivary catheter of medium size, 8 or 9 of the English scale, should be passed slowly and gently, or a silver catheter if necessary. If there be any difficulty in introducing the catheter, the patient should be anæsthetized, when the spasmodic element will entirely disappear, and the instrument, as a rule, pass readily.

Organic stricture may be defined as a permanent diminution in the calibre of the urethra, due to the development of organized lymph or scar tissue in its walls.

The most common cause of this condition is gonorrhœa, and particularly repeated attacks of this disease, followed by persistent and long-continued gleans. In the inflammatory stage plastic lymph is deposited in the mucous and submucous tissues, and may invade the corpus spongiosum. If this lymph is not absorbed, as it generally is, it organizes, and has a tendency to slowly contract, forming indurated masses which

narrow and distort the passage, and fibrous bands which partially or completely encircle the canal. These fibrous bands almost invariably encircle the urethra in its entire circumference. As a rule, they project equally from all aspects of the canal, but are sometimes thinner in one direction than another. The mucous surface may remain entire, but the friction caused by the urinary stream keeps up irritation, and may cause excoriation and ulceration at the seat of stricture, with fresh deposits of plastic lymph.

Injuries of the perineum, such as a kick, blow, or fall astride a fence or railing, are followed by the most intractable form of stricture—the *traumatic*. These causes operate most frequently in the bulbo-membranous junction, the urethra being bruised between the impinging body and the pubic arch.

Other causes of strictures are : cicatrices resulting from chancre at the meatus, or in the first $\frac{1}{2}$ inch or so of the tube ; tuberculous ulcer ; urethral abscess ; injuries resulting from unskilful catheterization ; laceration of the urethra by a calculus in its exit ; rupture of a chordee ; and the use of strong urethral injections.

The urethra may also be strictured congenitally. This is rare, but I have met with a few instances. I do not refer to congenital narrowing of the meatus, which is not uncommon, but which causes no inconvenience, and assumes no pathological importance unless the patient contract gonorrhœa, or exploration of the urethra or bladder be expedient, when it may be necessary to enlarge the orifice by an incision on its floor.

Stricture is most commonly met with between the ages of twenty-five and forty-five. This is, of course, due to the fact that gonorrhœa, its chief cause, occurs most frequently during the early years after puberty is reached, and that, as a rule, at least three or four years elapse before the stricture

makes itself felt to such an extent that recourse to the surgeon is found necessary. It may, however, occur at any age as a result of one or other of the causes already indicated. I have seen stricture in children caused by injury of the perineum, and laceration of the urethra due to passage of stone.

There are certain technical terms, which have the sanction of time and general usage, applied to strictures, according to their physical conformation or clinical features. Thus, 'linear' or 'bridle' stricture is the term employed when thin membranous septa or narrow bands extend across the canal and partially occlude it. 'Annular' stricture consists of a narrow band of tissue completely encircling the canal, the contraction being such as would be produced by tying a string round the urethra. 'Ribbon' stricture resembles the latter, except that it is broader. The 'tortuous' variety involves a considerable extent of the urethra, which is irregularly contracted, being narrower at certain points than at others, with the result that the passage through this part of the canal is distorted.

Then, clinically, we have the following varieties: 'Simple,' where the stricture is readily dilatable by instruments; 'resilient,' having a tendency to rapidly recontract; 'irritable,' when painful and liable to bleed on instrumentation; 'indurated,' when the scar tissue is very hard; and 'impassable,' or 'impermeable,' when the surgeon fails to pass an instrument through the opening.

The older English surgical writers, from Sir Everard Home to Sir Henry Thompson, held that stricture was most commonly located at the junction of the bulbous and membranous portions of the urethra. This tenet has in recent years been called in question, particularly by the American surgeons, headed by Otis. The latter considers that he has demonstrated by the urethrometer that stricture is much more common in the penile than in the deep urethra.

This diversity of opinion appears to me to be due to the different standards adopted as to what constitutes stricture, the American surgeon regarding as stricture any contraction of the canal, no matter how slight—even congenital narrowing of the meatus—provided it gives rise to pathological disturbances from the obstruction and friction caused thereby to the urinary flow. Judged by this standard, it is possible that the anterior portion of the canal may be most frequently affected. But after an experience of many thousands of cases I have no hesitation in saying that pronounced organic stricture requiring instrumental or operative interference is overwhelmingly most common at the bulbo-membranous junction, an experience entirely borne out by an examination of the pathological specimens in the museums.

The proneness to the occurrence of stricture at this situation is attributed to the facility with which discharges lodge in the dilated bulbous portion of the urethra, thus keeping up chronic urethritis with consequent inflammatory thickening or ulceration of the mucous membrane long after gonorrhœa has run its course in the penile portion.

The only kind of stricture known to occur in the prostatic portion of the urethra is the *traumatic*.

Stricture may be single or multiple. The latter is most common. It will be found, as a rule, that a tight stricture in the deep urethra is accompanied by one or more contractions of large calibre in the penile portion of the canal.

Symptoms of Stricture.

We now come to the symptoms of organic stricture, which are as follows :

1. There is diminution in the size of the stream. This has been coming on gradually for some time, possibly for years, till eventually the stream has become, perhaps, extremely small, or only a few drops of urine may be passed at a time.

2. As a consequence, the patient notices that he spends more time over the act of micturition than he formerly did.

3. The stream is probably forked, flattened, or twisted like a corkscrew. This, however, is a symptom to which too much importance must not be attached, as it may occur in persons free from stricture, owing to some peculiar conformation of the meatus, either congenital or acquired, from thickening of its lips from chronic inflammation.

4. Micturition may be accompanied by a good deal of straining to impel the urine through the narrowed passage, and particularly to get rid of the last few drops.

5. There may be dribbling of urine at the end of micturition, when the penis is allowed to hang down, so that the trousers get wet. This may be due either to atony of the bladder in cases of long standing, with inability to completely empty the viscus, or to inefficient contraction of the accelerator urinæ and compressor urethræ muscles, one of the functions of which is to expel the final drops of urine from the deep portion of the canal.

6. Increased frequency of micturition is one of the earliest symptoms. This may be due to reflex irritation of the neck of the bladder caused by the stricture, or to local cystitis caused by decomposition of the urine that remains in the urethra behind the stricture. In the later stages of the disease this symptom may arise from the fact that, through atony of its muscles, the bladder is never completely emptied of urine, thus reducing its effective capacity in a manner that will be described later on when we come to deal with prostatic enlargement.

7. There is frequently pain, usually of a scalding or burning character, *during* the act of micturition, felt, as a rule, at the seat of the stricture, contrasting with pain felt *after* the act when stone in the bladder exists, and *before* the act when due to prostatic enlargement. When cystitis co-exists there

will be dull, aching pain above the pubes, particularly when the bladder gets at all distended with urine.

8. Gleet discharge is a common accompaniment of stricture, and may be the first symptom that arouses the suspicion of the surgeon as to its existence. In all cases of long-standing gleet the presence of stricture should be suspected and searched for. The mucoid or muco-purulent discharge is due to granular patches or ulceration in the vicinity of the stricture.

9. When this symptom is present, copulation with a healthy female may excite a temporary urethritis resembling a fresh attack of gonorrhœa, for which it may be mistaken, especially after illicit intercourse.

10. There is sometimes a peculiar sensation of a creeping, crawling, or fluttering character felt in the urethra when stricture is present.

11. There may be pain of a scalding character in copulation during the emission of semen, and a few drops of blood may pass immediately after the act. In cases of tight stricture there may be no emission of semen, which is forced back into the bladder, and flows away when the penis becomes flaccid, or with the urine in the next act of micturition. Sterility may thus result.

12. There may be nocturnal emissions from reflex irritation. Partial or complete impotency may result from the enervating influence of the disease. And in some few instances excessive desire, or even priapism, may be induced by the reflex irritation of the stricture on the nerve-centre governing the sexual passions.

13. Sudden retention of urine may be the first symptom that attracts attention to the presence of stricture. This is always liable to occur as a result of chill, sexual excess, or errors in eating and drinking, causing congestion of the already narrowed canal, thus temporarily closing it up.

14. A peculiar train of neurotic symptoms is not unfrequently noticed; and, strange to say, these mostly occur in connexion with strictures of large calibre. Neuralgic pains in the back and loins, the groins, spermatic cords, testicles, perineum, rectum, and lower limbs frequently occur, giving rise to malaise, nervous irritability, and mental depression—symptoms which disappear when the stricture is successfully dealt with.

With some or all of the above symptoms there will probably be a history of one or more attacks of gonorrhœa some years before, or of an injury to the perineum accompanied by passing of blood from the urethra.

These, then, are the ordinary symptoms of organic stricture. You will rarely find them all present in any particular case. A combination of a certain number of them will lead you to suspect the presence of this disease.

In cases of long standing, however, extensive pathological changes occur in the urinary tract behind the seat of the contraction. These conditions are attended by symptoms that will give an additional clue to the primary cause of the mischief. We will now examine these changes under the heading—

Secondary Results of Stricture.

There is no part of the urinary tract behind the seat of the stricture that is not liable to be more or less affected by the backward pressure resulting from the obstruction to the flow of urine.

The portion of the urethra immediately behind the stricture is, as a rule, the earliest affected. Here the canal becomes dilated and pouched, with thinned and ulcerated walls.

This part of the canal is never free from the presence of a few drops of urine. This urine eventually decomposes and chronic inflammation is set up, giving rise to muco-purulent

discharge. Pasty phosphatic material from the alkaline urine is deposited here, and may conglomerate into a soft concretion. Or a small urate or oxalate calculus may be arrested at this point, which in a normal urethra would make its way out with the urine.

From the straining efforts of the bladder during micturition the thinned and ulcerated wall may give way, and sudden infiltration of a large quantity of urine take place into the perineal tissues and scrotum, resulting in septicæmia, sloughing of these parts, and death, unless early vent be given to it by free incision.

More frequently, however, a few drops of bacterial urine percolate through a ruptured follicle or fissure into the sub-mucous tissues, giving rise to perineal abscess with resulting urinary fistula.

Congestion of the prostate may supervene, or inflammation of that gland, terminating in abscess, from bacterial infection of its ducts.

The bladder is, however, the organ that suffers most frequently. If it remain free from inflammation, its walls, in the first instance, become thickened from compensatory hypertrophy to overcome the obstruction to the flow of urine; but eventually, under the continued backward pressure and constant straining, it becomes dilated, its walls get thinned, and the mucous membrane bulged out between the muscular fasciculi, pouches being thus formed, the inner aspect of the bladder presenting a honeycombed appearance when viewed through the cystoscope. In the saccules thus formed small calculi passing down from the kidneys may get trapped and grow into large ones.

More frequently, however, urine contained in a bladder that is never completely emptied decomposes from bacterial invasion. Cystitis is thus set up, which may continue for years, giving rise to great thickening of the walls with con-

traction of the bladder, so that only a small quantity of urine can be retained. I have opened and drained bladders of this kind on many occasions. The contents have invariably a fearful ammoniacal stench. The walls are covered with thick, ropy, and flaky muco-purulent matter, in which are embedded particles of phosphatic grit, and not unfrequently a phosphatic calculus is formed. The ureters become dilated and tortuous, with thickened walls.

The pelves of the kidneys dilate in the first instance as a rule, the pyramids get flattened and atrophied, the medulla and cortex compressed and sclerosed, and hydronephrosis may ensue. Eventually pyelitis supervenes, by infection from the bladder through the ureters the substance of the kidneys is attacked, and suppurative nephritis with numerous pus foci sets in. This is the condition known as 'surgical kidney'—a condition which renders a surgical operation of any kind extremely dangerous, death resulting frequently from suppression of urine due to shock, or from congestion of the kidneys due to the anæsthetic.

Associated with tight stricture of the urethra, hæmorrhoids and prolapse of the bowel are sometimes found, brought on by the constant straining to pass urine. Under conditions of this kind the patient frequently loses control of the sphincter ani, fæces being passed involuntarily during the efforts at micturition.

Epididymitis and orchitis not unfrequently occur in connexion with stricture, due to extension of the gleet discharge along the vas deferens, reflex irritation, or instrumentation.

Finally, constitutional symptoms, due to the absorption of toxins from the ulcerated stricture or some secondarily affected part of the urinary tract, may occur in the form of paroxysms of fever, attended by cold, hot, and sweating stages, resembling in many respects an attack of ague. These

paroxysms are particularly liable to occur in persons who have resided in hot climates like India, but they are wanting in the regular periodicity that characterizes malarial fevers, and disappear on the cure of the stricture. This is a matter to which Sir Everard Home called attention nearly a century ago, and from personal observation I can endorse the accuracy of his views.

Diagnosis by Instrumental Exploration.

Having, then, come to the conclusion that the symptoms, taken as a whole, point to the probable existence of stricture as their cause, we next proceed to complete the diagnosis by instrumental exploration of the urethra.

No matter how strongly the symptoms point in this direction, no definite opinion as to the existence of stricture should be expressed until such an examination has been made, for by this procedure only can a certain diagnosis be established.

But in order that we may be in a position to detect any lesion of the urethral canal, we must first be familiar with its normal capacity. I have, at the opening of this lecture, briefly directed your attention to a few of the physical features of the urethra, but have purposely refrained till now from referring to its calibre.

Fig. 1 is a rough sketch showing the normal calibre of the urethra in the adult male. It is a tracing from the original plate in Sir Everard Home's work, published about a century ago. He injected melted wax into the urethra from the bladder in the cadaver, and on consolidation the wax was, of course, a true cast of the canal. No other method has since been suggested that conveys such a true estimate of the capacity of the urethra throughout its entire course. You will observe that contractions occur at three positions—behind the navicular fossa, at the bulbo-membranous junction, and at the neck of the bladder; and it is at these points that

difficulty is sometimes experienced in introducing an instrument through the normal urethra. This difficulty is avoided by keeping the point of the instrument along the floor at the first-named position and along the roof at the other two.



FIG. 1 (HALF-SIZE).

For exploration of the urethra these olivary gum-elastic bougies (Fig. 2) are undoubtedly the best. They are tipped with olive-shaped bulbs, the stems being many sizes smaller in diameter. Metal instruments of the same pattern, either rigid or soft, are sometimes employed for the same purpose. I prefer the soft, flexible, gum-elastic ones, as less liable to cause pain or do injury, and more calculated to adapt themselves to the natural curves of the urethra.

In passing instruments of any kind through the urethra, the horizontal position is the best. The muscles are more

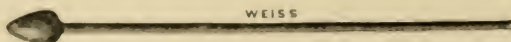


FIG. 2.

thoroughly relaxed than in the standing posture, and the risk of a fall from the patient suddenly fainting is thus avoided.

If you take a largish instrument—say, 21 or 22 French scale (= 12 English)—lubricated, and of course previously

rendered aseptic, and introduce it slowly through the normal urethra, you will find that it glides along easily till the membranous portion is reached, the patient being conscious only of a slight sensation of heat or scalding, which is natural, and due to the peculiar sensitiveness of the mucous membrane. At this situation you will be aware of some resistance, and your patient of distinct tenderness, owing to the urethra being narrowed at this point, and to the fact that the canal is here encircled by the compressor urethra muscle, which holds it, as it were, in its grasp. By gentle, steady, onward pressure, at the same time rendering the penis somewhat tense by drawing it on to the instrument, you will overcome this physiological resistance; and after the bougie has passed the membranous portion, it will glide on easily and without pain through the prostatic portion and enter the bladder, the only sensation felt being a desire to pass urine as the inner orifice is reached. Withdraw the instrument just as slowly and gently as it was inserted, noting again the resistance offered by the membranous urethra to the return passage of the bulb.

In passing instruments of any kind through the urethra there are three cardinal maxims that should always be borne in mind—viz., not to use force, not to give pain, and not to draw blood. The first of these precepts is under our control; it may not be always possible to fully carry out the latter two in practice, for some patients are extremely sensitive, and certain conditions of the urethra are very painful and liable to bleed on the slightest pressure. Nevertheless, these ideals should always be aimed at.

We now pass from the exploration of the normal to that of the strictured urethra. This is conducted in a very similar manner. Commence as before with a large olivary bougie—No. 21 or 22 F.—passing it gently down the canal till you meet with the obstruction. If after gentle pressure continued

for a few moments against the face of the stricture, whilst the stem is held at various angles, the instrument fails to pass, withdraw it; before doing so, however, notice the position of the stricture, whether in the penile, scrotal, or perineal portions of the canal, and measure its distance from the meatus, the penis being relaxed, not stretched on the bougie.

It is possible that in the progress of the instrument through the canal to the point at which it comes to a dead stop, you may be conscious of the existence of one or more contracted bands through which the bulb just passes, though rather tightly, for in a large proportion of cases having gonorrhœa for their origin the stricture is multiple, a tight stricture in the deep urethra being associated with one or more of large calibre in the anterior portion. These bands will again make their presence felt by the resistance offered to the withdrawal of the bulb.

We next introduce a bougie several sizes smaller—say, No. 16 F. (9 E.)—and ascertain if this will pass readily through the obstruction. If so, we know that there is a stricture at this site, in calibre intermediate between 16 and 22 F.; and by trying consecutively larger sizes we soon arrive at its exact capacity.

In withdrawing the bougie when the bulb is obstructed or caught we again measure the distance from the meatus. The difference between this and the previous measurement taken from the anterior surface of the stricture indicates its length. It must be remembered, however, that this is only an approximate measure of the length of the stricture—a measure, in fact, of the pronounced portion of the contraction only; for the urethra is, as a rule, more or less involved for some distance in front of and behind this, the strictured passage being irregularly hour-glass in shape.

Should No. 16 fail to pass, we try a considerably smaller

bougie—say, No. 12 (6 E.)—and so on, down through the scale, skipping over several numbers at a time, so as to avoid unnecessary instrumentation.

The peculiar construction of these olivary bougies, which permits of the bulb alone being in intimate contact with the canal or stricture, the narrow stem being quite free in the urethra, their lightness and flexibility, enable us to gauge to a nicety the position, calibre, extent, density, and other characteristics of the stricture.

Should we fail to insert even the smallest of these olivary bougies, viz., No. 6 F. (2 E.),—for owing to the disproportion between the bulb and stem they cannot be made of lower grade,—we probably have to deal with a very narrow stricture.

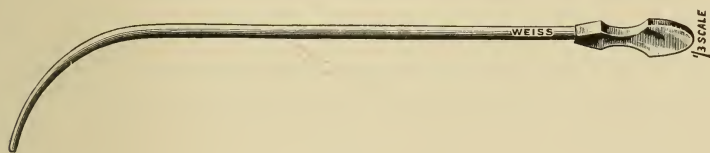


FIG. 3.

I say *probably*, because if the obstruction be met with in the deep urethra, there is a condition sometimes found in this situation, even in the normal canal, which I have already referred to, viz., spasm, which may simulate organic stricture and not yield to these soft instruments.

To ascertain if this condition be present, we select a fairly large solid steel dilator of this kind (Fig. 3)—say, No. 18 F. (10 E.)—and having warmed and oiled it, pass it as far as the obstruction and wait. No force is to be used. If the obstruction be due to spasm, the simple weight of the instrument aided by the gentlest pressure will overcome this and carry it through. If it fail to advance, we know for certain that a tight organic stricture is present.

We next bring to our aid these tapering bulbous bougies

(Figs. 4, 4A), which, as will appear later on, are the instruments *par excellence* for dilatation of stricture. There are no other instruments that can, as a rule, be so easily inserted through a stricture, but they do not, like the olivary bougies (Fig. 2), convey to the fingers a delicate appreciation of its calibre, extent, and density. We select a No. 6 or 7 F. and endeavour to insinuate it through the stricture, employing smaller sizes, if necessary, till we accomplish our object.

For the purpose of measuring the capacity of the urethra, detecting the presence of strictures, and ascertaining their calibre, the urethrometer (Fig. 5) was invented by Otis. It consists of a series of small ribs, which are projected in some-

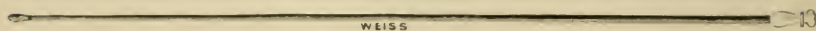


FIG. 4.

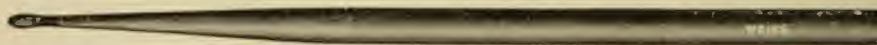


FIG. 4A.



FIG. 5.

what umbrella-fashion by means of a screw in the handle, so as to form a bulb of varying dimensions at the end, the degree of expansion being indicated by a dial hand. This instrument is particularly useful when the meatus is narrow, for under such circumstances the olivary bougie that passes through this would fail to detect a stricture of larger calibre situated farther on. For instance, suppose a urethra the general calibre of which is 30 F. with a meatus of only 18: a stricture in this canal of 22 could only be detected by the olivary bougies after performing a preliminary meatotomy, whereas the urethrometer would detect it at once. This instrument was very popular in America some years ago, though it is less

so now. It never came much into use in England. I consider the olivary bougies as efficient for detecting and measuring strictures, besides being simpler and safer, though a preliminary meatotomy may be necessary. The urethrometer is not altogether devoid of danger, for the mucous membrane may be pinched between the ribs in closing the instrument. To obviate this a thin rubber sheath has been introduced, but this renders it so clumsy that only strictures of large calibre can be measured, and not very accurately.

But if we can dispense with its use in the diagnosis of stricture, it is to this instrument, in the hands of the distinguished surgeon who invented it, that we owe a revolution in the surgery of the urethra and bladder, for it was Otis who first demonstrated that the urethra is much more capacious than was previously imagined, thus paving the way for a more rational treatment of stricture, and the introduction of litholapaxy.

LECTURE II

TREATMENT OF STRICTURE BY DILATATION : MANAGEMENT OF COMPLICATED CASES

HAVING verified the existence of organic stricture by instrumental exploration of the urethra, the next question for consideration is that of treatment.

Our aim, of course, must be to restore the canal to its normal capacity and maintain it in that condition. Many methods of treatment having this object in view have from time to time been introduced, some of them with merely a transient popularity. I shall only deal in detail with those that at the present time are regarded as of established value, of which there are five :

1. Dilatation by interrupted instrumentation.
2. Dilatation by continuous instrumentation.
3. Internal urethrotomy.
4. External urethrotomy.
5. Urethrectomy.

Now, one is frequently asked the question, What is the best method of treatment for stricture? The reply, of course, is that there is no particular method suitable to all cases. The different methods are not to be regarded as rivals. They are supplementary to each other, each having a useful sphere of its own, appropriate to particular varieties of the disease.

Dilatation, whether 'interrupted' or 'continuous,' is undoubtedly the simplest and best mode of treatment for the

great majority of strictures. It should almost invariably be attempted in the first instance, and only abandoned in favour of operative methods when, owing to certain difficulties or complications that may arise, it may be found inefficient or impracticable. It has the further advantage that it in no way militates against the employment of operative interference should such subsequently be found necessary. On the contrary, partial dilatation facilitates operation, for some varieties of which it is absolutely essential.

Interrupted Dilatation.

Dilatation by interrupted instrumentation consists in the introduction of instruments of gradually increasing size at stated intervals till the stricture is enlarged to the normal calibre of the urethra.

It is suitable for all cases of recent formation, whilst the organized lymph is more or less plastic, and not converted into dense fibrous tissue. Strictures situated in the bulbous portion of the urethra are, as a rule, amenable to this form of treatment, whether single or associated with one or more of large calibre in the penile portion.

This method of treatment has the great advantage that the patient can pursue his usual avocations during its employment.

For this form of dilatation, flexible, tapering bulbous bougies (Figs. 4, 4A) are employed in the early stages. Rather stiffish instruments should be selected, for they can be rendered quite soft by immersion in warm water. The very soft varieties become so extremely limp after a short time in use that they are worthless for passing through strictures. There is, as already stated, no other instrument that can, as a rule, be so safely and easily introduced through the urethra. Somewhat similar bougies are constructed with conical

tapering ends (Fig. 6). These should be avoided, for the sharp points are liable to get engaged in lacunæ and false passages, to obviate which the bulbous termination was devised.

Bougies, and, indeed, urethral instruments in general, are constructed according to two different scales—the French (or Charrière) and English. The French instruments increase in size by a millimètre in circumference, the number of the instrument indicating its circumference in millimètres, and they range from 1 to 30, or even higher. The ordinary range in England is from 1 to 12, though they are now made specially much larger. The measurements are arbitrary, and do not follow any scientific rule as in France. Indeed, there is no uniform scale adopted in this country, the gauge of one



FIG. 6.

maker differing slightly from that of another. The French scale possesses the following advantages: (1) It is scientific and exact, so that if any particular instrument, say No. 10, is admitted through a stricture, we know at once that the calibre of the stricture is 10 millimètres in circumference. (2) The range is much more extensive than the English, commencing with much finer and ending with much larger instruments. (3) The augmentation is much more gradual, the increment in size between any two consecutive numbers being much less. Thus, the English numbers 1 to 12 extend over the French numbers 3 to 21.

Method of effecting Interrupted Dilatation.

Having at the first interview ascertained the calibre of the stricture by means of the olivary bougies (Fig. 2), we intro-

duce consecutively one, two, or three of the tapering bulbous bougies (Figs. 4, 4A) till we arrive at that size, say 7 F., that just fills the stricture, passing easily, however, without the use of any force. The instrument is withdrawn, and the patient directed to return at intervals of two or three days. At the second interview we begin with No. 6, and follow this by 7, 8; on the third occasion pass 7, 8, 9; and so on, always beginning with a bougie one size smaller than the largest introduced on the previous occasion, and advancing to one or two sizes beyond it, as may be desirable, no stretching of the stricture, however, being permissible.

The instruments are withdrawn at once slowly. No advantage is gained by leaving them in the stricture for a few minutes; on the contrary, spasm, irritation, and even inflammation, may be set up. It is only after an instrument has remained in for several hours, as in continuous dilatation, that spasm subsides, as will appear later on.

Having gradually dilated the stricture up to 18 or 19 (10 E.) by means of these flexible bulbous bougies, we lay them aside, and continue the process by means of the highly polished conical steel dilators (Fig. 3). The flexible bulbous bougies in the smaller numbers are soft and pliant, and adapt themselves easily to the contour of the urethra. The larger numbers are, however, rather stiff and clumsy, so that their points, which beyond the stricture are out of control, are liable to impinge against the floor of the prostatic urethra, cause pain, and sometimes be arrested there; whereas these large blunt steel dilators can be guided easily through the canal, and they possess a dilating power which does not appertain to the soft instrument.

The dilatation by these steel instruments must be continued till 15 or 16 of the English scale is reached, not 11 or 12, as is laid down in the English text-books, for Otis has shown that the urethra is much more capacious than

was formerly imagined. Whatever method of treatment be adopted, whether dilatation or operation, we must not rest satisfied till the urethral canal is brought up to its normal capacity: otherwise the stricture is bound to recur.

When the stricture has been dilated to the normal capacity of the canal, full-sized instruments must be introduced at increasingly distant intervals—first weekly, then fortnightly, monthly, quarterly—as the case may require, to ascertain that there is no recontraction; or if there be such, to keep the stricture dilated.

Dilatation Rationally Explained.

Let us now inquire into the principles involved in interrupted dilatation of stricture. There are two distinct processes going on concurrently during the enlargement that takes place. Firstly, the successive introductions of several instruments of gradually increasing size effect a true expansion of the morbid tissues. Secondly, there is absorption of these tissues taking place at the same time. And in proportion as the latter process predominates will the good results be lasting. The simple contact of an instrument with the morbid tissues of a recent stricture, without the employment of any undue pressure, induces softening and absorption of that tissue. In proof of this the following facts may be advanced: (1) If a small instrument that just passes through a stricture, exerting no pressure thereon, be tied in for several days, the stricture will have enlarged to such an extent that the instrument lies quite loosely therein, and one several sizes larger can be introduced with facility. (2) In many cases of so-called 'impassable' stricture, if an instrument be introduced as far as the face of the stricture, and held against or in its orifice for some hours, the morbid tissues will be modified to such an extent that a filiform bougie will pass readily into the bladder.

How the softening and absorption of the morbid tissues are brought about it is impossible to say definitely. It is presumed they are due to alteration in the nutrition of the tissues caused by an increased vascular supply induced by the contact of the instruments. However this may be, the fact remains that the simple contact of an instrument with the morbid tissues of a stricture renders them soft and easily dilatable, and at the same time induces absorption, and that these results are independent of any mechanical pressure.

On no account, therefore, should force be employed in passing an instrument for the purpose of interrupted dilatation. Not alone is it unnecessary: it is mischievous, and may be attended by danger. It causes splitting and laceration of the stricture, which renders the urethra intolerant of instrumentation. It may be attended by untoward results, such as ulcer, abscess, urinary infiltration, fever and retention of urine, and is invariably followed by recontraction of a more unmanageable type.

If a stricture is not dilatable without the employment of force in introducing instruments it is not a case suitable for this mode of treatment, and must be relegated to a cutting operation.

I have dwelt somewhat at length on the principles that underlie the cure of stricture by interrupted dilatation, because, though well recognised in France, they are scarcely understood in this country, where the process of dilatation is attributed to the mechanical pressure alone of the instruments employed.

Continuous Dilatation.

We now pass on to the consideration of 'continuous dilatation,' which consists in introducing an instrument through the stricture, securing it in this position, and replacing it by a succession of others of gradually increasing dimensions at

intervals of one, two, or three days, till the normal calibre of the urethra is reached.

As the instrument remains constantly in the urethra, *catheters*—not bougies—must be employed for this purpose, in order that the urine may flow thereby; and these catheters should be soft and flexible, so that they may accommodate themselves to the contour of the canal and obviate pain. Later on we shall see that in cases of very tight stricture, however, where difficulty has been experienced in introducing even a filiform bougie, or perhaps a fine metal catheter, the instrument should not be withdrawn, but left *in situ* for a day or two, urine passing beside the bougie, till sufficient dilatation has taken place to permit of a small soft catheter being introduced and tied in.



FIG. 7.

For the purpose of continuous dilatation cylindrical gum-elastic catheters (Fig. 7) are best, owing to the eye being placed close to the end of the instrument, so that the urine can flow without any considerable portion lying in the bladder, as would be the case were tapering bulbous catheters, in which the eye is necessarily situated about $1\frac{1}{2}$ inches from the point, employed.

The patient must, of course, remain in bed or lying on a sofa during the progress of this mode of treatment, which generally lasts about a fortnight.

The following is the most practical method of securing the catheter in the urethra: The instrument is passed as far as the neck of the bladder till the urine begins to flow. A spigot of wood is then placed in the end of the catheter. Two pieces of very narrow tape or thick, soft, cotton cord, 10 or 12 inches long, are tied at their middle round the

catheter, at a point 1 inch from the end of the penis. The four ends are then spread out at equal distances along the penis, and secured in this position by a strip of adhesive plaster 1 inch wide wound round the organ, some of the hair of the pubes being included to prevent the plaster from slipping. The catheter should then be withdrawn slightly, so as to render the cords taut, and allowed to remain in that position till the patient desires to pass urine, when the spigot should be withdrawn and the instrument passed on just so far as to permit the urine to flow. The spigot is replaced and the catheter withdrawn as far as the cords will permit. By this arrangement the end of the catheter is never in the bladder except during the act of micturition, and irritation leading to cystitis is thus obviated.

The catheter should invariably be a size smaller than the stricture can admit—that is, it should fit quite loosely. Otherwise, if it fit tightly, the pain and irritation set up will render the treatment unbearable.

After the catheter has been tied in for some hours there will be a free flow of muco-pus from the urethra, due to softening down of the morbid tissues from contact of the instrument. Each time the catheter is replaced the anterior urethra should be syringed out with a weak solution (1 in 6,000) of perchloride of mercury.

Continuous dilatation is employed under the following conditions:

1. When we fail to make progress with 'interrupted dilatation.'
2. When speedy relief is required owing to the occupation of the patient.
3. When, owing to cystitis existing as a complication, continuous drainage through a catheter is required.
4. When, through age or debility, and particularly when

disease of the kidneys is known or suspected to exist, an operation is inadmissible.

5. In tight strictures, and such as involve difficulty in introducing instruments, it will almost invariably be necessary to commence treatment by continuous dilatation, and when sufficient progress has been made to permit of the easy introduction of bougies, to continue the treatment by 'interrupted dilatation.'

6. As will appear later on, continuous dilatation has almost invariably to be employed as a preliminary to internal urethrotomy.

In most cases, as soon as we have dilated a stricture up to 16 or 17 F. (9 E.) by the 'continuous' method, the treatment should be completed by the passage of large steel dilators by the 'interrupted' method. Thus it will be seen that these two modes of dilatation are frequently supplementary to each other.

During 'continuous,' as in 'interrupted' dilatation, it not unfrequently happens that febrile disturbances accompanied by rigors supervene, which may necessitate the temporary or complete abandonment of this method of treatment. But its great drawback is the rapidity with which recontraction takes place, even when an instrument is passed periodically with a view to maintaining the calibre of the urethra.

The Treatment of Tight and Complicated Strictures.

In describing the treatment of stricture by dilatation I have assumed that we were able to pass a fine, tapering, olivary bougie in the first instance with comparative ease. It may happen, however, owing to the extreme narrowness of the stricture, or its being complicated by the existence of false passages, or from other causes, that we may fail to pass one of these bougies.

We then have recourse to these fine filiform gum-elastic bougies of various shapes (Fig. 8), some tipped with tiny bulbs, others rather sharply pointed. We also employ these catgut cylindrical bougies (Fig. 9), some of them of extreme fineness. Sometimes you will succeed with one variety, sometimes with another.

They are also made of whalebone. I believe these were first introduced into America by Dr. Bangs. I merely mention them here to warn you against their employment. I have completely discarded stiff filiform bougies from my practice, regarding them as dangerous weapons, more calcu-

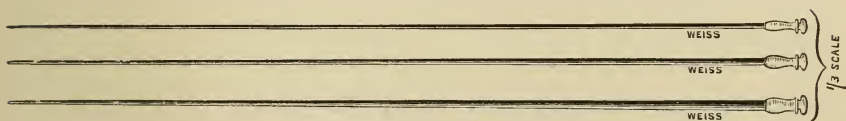


FIG. 8.

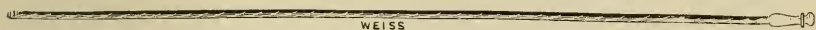


FIG. 9.

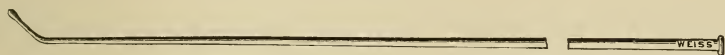


FIG. 10.

lated to puncture the mucous membrane and produce false passages than to get through the strictured canal.

In the endeavour to pass these filiform bougies through a tight stricture, a good deal of manipulation and manœuvring will frequently be necessary, and your patience will often be put severely to the test.

Render the bougie quite straight in the first instance, and introduce it as far as the stricture, the face of which is then searched by alternately advancing and withdrawing the tip of the instrument, endeavouring to engage it in the opening of the stricture, and then, by gentle pressure and perhaps rotation, to push it through the narrow passage.

Should you fail in your efforts to do this, withdraw the bougie, and substitute one with the end bent at an obtuse angle to the stem (Fig. 10). To obtain the bend plunge the bougie into warm water, give it the necessary angle, and then plunge it into cold water, when it retains its new shape. With this bent bougie institute a methodical search for the opening all round the outer rim of the obstruction, for the orifice of the stricture, instead of being centrally placed, may lie at the outer margin.

These filiform bougies are also made bayonet-shaped (Fig. 11), and employed in the manner just described.

The employment of filiform bougies with tendril or cork-



FIG. 11.

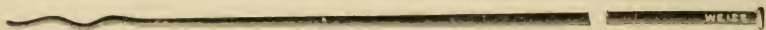


FIG. 12.

screw terminations (Fig. 12) will sometimes be found advantageous in overcoming the difficulties connected with the passage of these very tight strictures.

Having succeeded in passing a fine instrument of any kind through a tight stricture, it should not be removed, but tied in, and continuous dilatation had recourse to in the first instance.

The introduction of an instrument through a narrow stricture will always be facilitated by injecting warm oil into the urethra, so as to distend it. Some of the oil passes back through the narrow passage, lubricating its sides and possibly dilating it slightly, thus rendering the introduction of the bougie easier. Do not allow the oil to escape, but, pinching the end of the penis between the thumb and forefinger of the left hand, introduce the bougie, endeavouring to manipulate

it through the stricture whilst the urethral walls are distended by the oil. -

One of the most serious difficulties that we may have to contend with when dealing with a stricture, whether tight or otherwise, is the existence of what is called a 'false passage.' A false passage results from a wound of the urethra produced during unskilful attempts to introduce an instrument, whether by a surgeon or by the patient himself. As a rule, the opening into a false passage is situated on the floor of the urethra, and is most commonly found in the bulbous portion. This is due to the fact that the canal is here naturally dilated and somewhat pouched downwards, before it rather suddenly contracts to form the membranous portion, so that a natural barrier is thus formed, against which the point of a stiff instrument is liable to impinge, and, if unskilfully guided onwards, or force be used, to be driven through the tissues, which are in this situation loose and delicate, and so out of the canal. Imagining that the point of the instrument is still in the urethra, the surgeon may push it onwards so as to again enter the canal behind the stricture, or it may travel backwards between the prostate and the rectum, and perforate the latter, or even the bladder. With rest and proper treatment such a wound may heal so that no trace of its existence may be left; but in a large proportion of cases a small pocket or even canal running for a considerable distance will remain—a pitfall for the unwary, or sometimes even the skilful surgeon.

Now, how are we to deal with a complication of this kind? We must avoid the aspect of the urethra on which the opening into the false passage exists—that is to say, we must, as a rule, guide the point of the instrument along the roof of the urethra. I fear the soft instruments, of which I am such a warm advocate in most cases, must be laid aside as not suitable to help us out of our difficulty. We must employ a

rigid instrument, over the distal point of which we have control, and that rigid instrument will, as a rule, be a metal catheter, so that we may be definitely certain that it has reached the bladder, as indicated by the issue of urine through it, and not merely entered the false passage. When we have succeeded in manipulating a small catheter of this kind (Fig. 13), through what we conceive to be the stricture, the forefinger of the left hand should be inserted into the rectum to ascertain if the instrument is really in the urethra, in which case you will feel the thickness of the prostate intervening; whereas, if in a false passage, the catheter will be felt more distinctly, only the thin coats of the bowel lying between it and the finger, and it will probably be out of the middle line. If the catheter should be felt in the false passage, it should be withdrawn an inch or two, and again passed on, keeping its point close along the upper aspect of the urethra, and endeavouring by successive attempts to enter the stricture. You will recognise when the instrument has entered the bladder by your being able to rotate the point freely from side to side, and, of course, by the exit of urine if a catheter is used. Having succeeded in introducing a catheter, it should be tied in, for the case must be treated by continuous dilatation, at any rate till we have advanced to such a degree that an instrument of considerable size can be passed with facility. Cylindrical gun-elastic catheters (Fig. 7), armed with stylets, may also be employed instead of the metal instruments. They are superior to the metal catheters for tying in the bladder, but being less rigid and less highly polished, they are not so easily guided in.

Another expedient that is sometimes had recourse to in cases of this kind is that of passing a bougie, engaging it in the false passage, and leaving it *in situ*. Another instrument is then introduced, the true orifice of the stricture is searched for and entered. Theoretically this procedure would appear

sound and easy of execution ; but in practice I cannot say that I have found it very efficient.

The urethroscope (p. 60) is of great aid in these cases of tight stricture complicated by a false passage. Introduce the largest tube that the urethra will admit, and after some manipulation you will bring the true orifice of the stricture into view by means of the reflected electric light. A fine bougie is then passed, engaged in the opening, and held there whilst the tube is withdrawn, and then coaxed through the stricture if possible.

Your first interview with a patient supposed to be suffering from stricture will generally be in your consulting-room, or at the out-patient department of your hospital. Having diagnosed the existence of stricture, you will endeavour to pass an instrument of some kind through it. But you may discover that it is so tight, or otherwise complicated, that after several trials you find it impossible to introduce even a small filiform bougie as far as the bladder. You will, naturally, be disappointed, for, apart from the fact that no surgeon relishes being thwarted in his attempts to pass an instrument through the urethra, there is no doubt that the successful introduction of a bougie without pain through a difficult stricture at once commands the confidence of the patient. Do not, however, prolong the séance unnecessarily by persistent futile attempts to insert an instrument. Send the patient to bed, administer a brisk purgative, place him on light diet with absence of all stimulants, let him drink freely of demulcent fluids, such as barley-water, and give him an alkaline mixture combined with hyoscyamus, to remove acidity of the urine and allay spasm. If, after a day or two, you repeat your attempts at the introduction of an instrument, you will in all probability find that you will be successful. A loaded bowel and muscular tension due to walking exercise are calculated to produce congestion and

spasm at the seat of stricture, which pass off under the regimen indicated.

There is a simple device which I sometimes find useful in cases of very tight and intractable stricture. We will assume that unsuccessful attempts have been made to introduce a bougie, even after the patient has remained in bed for some days. The bougie enters the stricture, but no amount of coaxing will induce it to pass right through. Now, in a case of this kind, if we insert the bougie as far as it will go and leave it there, with instructions to the patient to look after it and prevent its slipping out, the probability is that after the

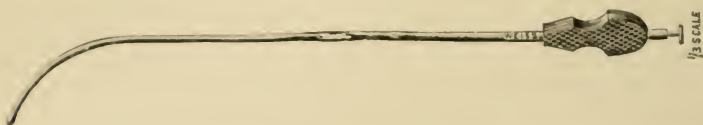


FIG. 13.

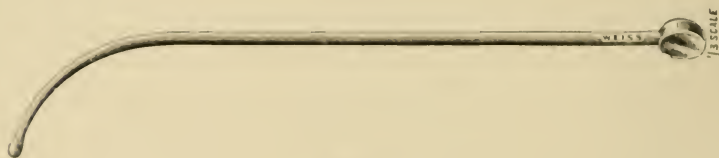


FIG. 14.

lapse of three or four hours the instrument can be readily pushed through. An intelligent patient will second your efforts in this direction, and it is not improbable that on your return visit you may find that he has in the meantime managed to manipulate the instrument into the bladder. The continuous contact of the tip of the bougie with the morbid tissues dissipates spasm and induces partial resolution of the stricture.

When two or more distinct tight strictures are present, situated at considerable distances from each other, we may have much difficulty in inducing a soft bougie to travel through the canal, owing to its being gripped by the anterior

stricture, so that we have no control over its point to manipulate it through the deeper stricture or strictures. Under these circumstances we must frequently have recourse to rigid catheters or bougies, preferably with slightly bulbous points (Figs. 13, 14). When the strictures are situated in the penile portion of the urethra straight instruments will be preferable. When with these instruments we fail to penetrate the deeper strictures, we must treat the proximal one in the first instance, and when that has been sufficiently dilated to permit of free play of the bougies, we attack the next stricture. But, as a rule, to which there are few exceptions, strictures, when multiple, diminish in calibre in proportion with their distance from the meatus.

A somewhat similar difficulty to that described in the last paragraph may present itself when the urethra behind a tight stricture is dilated, pouched, and distorted. This condition is particularly prone to occur in the prostatic portion, the mucous membrane of the floor of which may be reticulated and thrown into transverse folds, with deep lacunæ interspersed. In a case of this kind, after we have succeeded in introducing a soft instrument through the stricture, it may be tightly grasped, so that we have no control over its point, which in its onward course may get engaged in one of the lacunæ or folds, and no amount of manipulation will carry it into the bladder. To overcome this difficulty we must withdraw the instrument, and in its place substitute one with a coudée end, which, kept directed towards the roof, will facilitate its onward passage over the irregular floor of the urethra. But if the bougie has in the first instance been introduced with difficulty through the stricture, it may be advisable to tie it *in situ* for a couple of days, the urine being passed beside it, at the end of which time the stricture will probably have sufficiently dilated to permit of the introduction of an instrument into the bladder. But here, again,

it may be necessary to have recourse to a rigid instrument, the tip of which, after traversing the stricture, may be guided over the prostatic obstruction by the aid of a finger introduced into the rectum.

When we have to deal with a tight stricture, and for any particular reason, such as threatened retention of urine or the existence of great irritability of the bladder, it is thought desirable to secure considerable dilatation at the first interview, there is no method of accomplishing this with greater facility and certainty than the following. A filiform bougie armed with a screw on its proximal end is first passed through the stricture; on to this is screwed a fine plated steel dilator

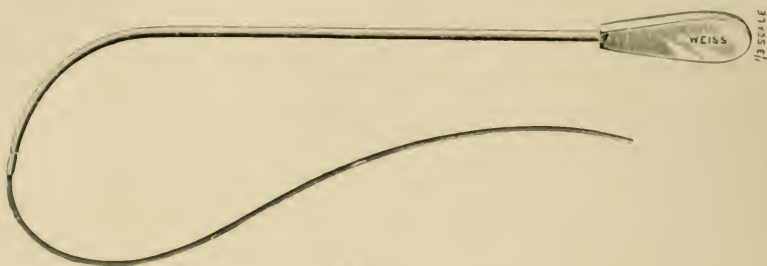


FIG. 15.

(Fig. 15), No. 2, English scale; the soft conductor is then pushed on into the bladder, where it curls up, followed through the stricture by the metal dilator. The latter is then withdrawn and unscrewed, but the soft guide is left in the urethra. The next larger-sized metal dilator is then attached and passed in as before; and so on, till we have dilated the stricture to Nos. 5 or 6, English scale, when the guide is withdrawn and a loosely-fitting catheter—say No. 4, English—tied in. This procedure can, as a rule, be accomplished without an anæsthetic, with the aid of a 5 per cent. solution of cocaine injected into the anterior urethra if necessary. We shall see later on the great advantage of this

method of temporarily dilating a stricture under an anæsthetic to enable us to introduce a staff for the purpose of performing external urethrotomy.

Another method of facilitating the introduction of a catheter in difficult cases is to screw a straight, thin steel rod (Fig. 16), like a knitting-needle, on a soft conductor. This is then passed through the stricture and a tunnel catheter



FIG. 16.

slipped over the guide, which is then withdrawn, leaving the catheter *in situ*.

Finally, when all these various manipulations fail in our efforts to pass an instrument through a tight stricture, we may find that if the patient be anæsthetized we may succeed with ease in passing one, when it should be tied in and the treatment by continuous dilatation proceeded with; unless we decide to proceed forthwith to one or other of the operations to be described in the next lecture.

LECTURE III

OPERATIVE TREATMENT OF STRICTURE

WE now pass on to the operative methods of dealing with stricture, of which the most useful and important is

Internal Urethrotomy.

This consists in division of the morbid tissues by means of a cutting instrument introduced within the urethra.

The varieties of stricture for which internal urethrotomy is useful are:

1. Those situated at the meatus urinarius, and in the 3 or 4 inches of the urethra immediately behind this, particularly tough fibrous bands encircling the canal. It is found in practice that strictures in these situations are not very amenable to dilatation, and that they rapidly recontract, whilst, on the other hand, they are easily and safely cut.

2. Bridle strictures. These invariably recontract after dilatation.

3. Old confirmed strictures at the bulbo-membranous junction, of fibrous or cartilaginous consistence.

4. Strictures in which dilatation has been tried and failed, owing to the supervention of fever when we attempt to carry the dilatation beyond a certain limit.

5. Resilient strictures, which rapidly contract after dilatation, and cannot be maintained at or near the normal capacity of the urethra by the periodical introduction of instruments.

There are two distinct methods of carrying out this plan of treatment, both of which are associated with the names of eminent French surgeons:

1. Civiale's method, which consists in passing a sheathed blade through the stricture without the aid of a guide, the blade being then projected and the morbid structures divided *from behind forwards* on the withdrawal of the instrument.

2. Maissoneuve's method, in which the incision is made *from before backwards* by means of a blade conducted along a metal guide previously introduced through the stricture.

Innumerable instruments have, from time to time, been devised for the purpose of carrying one or other of these



FIG. 17.

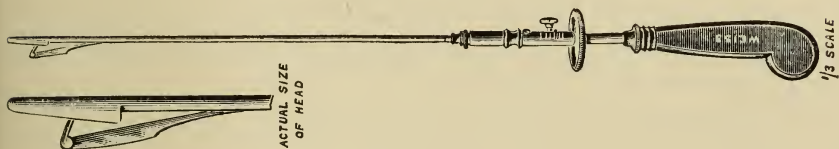


FIG. 18.

methods into execution. I shall only describe one of each kind—that which I have found most practical—and the manner of employing it. Before doing so, however, I may mention that the simplest and best way of dividing a stricture at or near the meatus is by introducing a narrow director into the urethra, and along the groove of this a narrow-bladed knife. The stricture is divided on the floor of the canal as the knife is withdrawn. Or the bistouri caché (Fig. 17) may be employed for this purpose.

Civiale's Method.

Civiale's urethrotome (Fig. 18) consists of a grooved shaft terminating in a conical bulb. Within this bulb is concealed

a sharp blade, which is capable of being projected by means of a mechanism near the handle to any extent required up to the maximum, and as easily returned within the bulb. The degree to which the blade is projected is indicated by a little button moving along a series of notches on the shaft near the handle.

As the bulb of this instrument measures ten of the French scale (5 E.), some preliminary dilatation of tight strictures is necessary to enable it to pass through. This is accomplished by 'continuous dilatation,' which generally occupies two or three days, a catheter of No. 10 F. being tied in the night before the operation. It is not advisable to dilate the stricture beyond this, so that it may oppose to the blade the largest surface possible, and thus facilitate its complete division.

The catheter is left in till the time of the operation, and on its withdrawal the urethra is thoroughly cleansed of the muco-pus that will be present, by injection from a syringe or irrigator of a solution of perchloride of mercury (1 in 6,000).

The urethrotome, sterilized, warmed, and lubricated, is then slowly and carefully introduced through the stricture or strictures, as the case may be, till its end is felt quite free in the bladder on movement of the handle from side to side. This urethrotome, you observe, is quite straight; but with a little practice a straight instrument is as easily passed through the urethra as a curved one.

The instrument is now withdrawn till the heel of the bulb impinges against the posterior aspect of the stricture, the blade is projected to the required extent with its edge towards the floor of the urethra, and drawn smartly through the morbid tissues till all resistance ceases, when it is again sheathed. If other strictures exist nearer the meatus, they are treated similarly before the withdrawal of the urethrotome.

The position of the strictures will have previously been ascertained by means of the olivary bougies, and their distances from the meatus noted, so that at the time of the operation we know where we are likely to meet with resistance to the bulb.

To ascertain if the stricture has been thoroughly divided a large steel dilator (Fig. 3), No. 24 F. (14 E.), is gently introduced. No force whatever should be employed, the instrument when properly guided falling by its own weight into the bladder. This is followed by Nos. 26 and 28 F. (15, 16 E.), which should pass as before without the employment of any force. If this latter pass easily, the stricture has been thoroughly cut and the operation is completed.

But if obstruction be offered to any of these steel dilators, the urethrotome should be again introduced and any uncut fibrous bands divided. These steel sounds are to be employed merely as measuring instruments, to ascertain if the morbid tissues have been fully divided up to the normal capacity of the urethra. On no account are they to be used as dilators. I hold that to partially incise a stricture and then dilate it still further is extremely bad surgery, and open to all the objections that have banished divulsion from modern practice. The success of this operation depends on the morbid tissue being completely cut through on one aspect.

Having satisfied ourselves that the stricture has been thoroughly divided, we introduce a large gum-elastic catheter, No. 23 or 24 F. (12, 13 E.), draw off the urine and any blood that may have trickled into the bladder, and then wash out the latter with a saturated solution of boric acid by means of a metal syringe or irrigator. I formerly used solution of perchloride of mercury (1 in 6,000), but found that it irritated the bladder, and induced constant desire to micturate when the patient woke from the anæsthetic; whereas our aim should be to have the bladder

completely at rest, so that no urine may be passed for several hours after the operation. The gum-elastic catheter is then tied in the bladder, in the manner already indicated (p. 26), for forty-eight hours, and the urine allowed to pass in this way.

Maissoneuve's Method.

This (Fig. 19) is Maissoneuve's urethrotome, but I consider Tevan's modification of it (Fig. 20) the safest and most

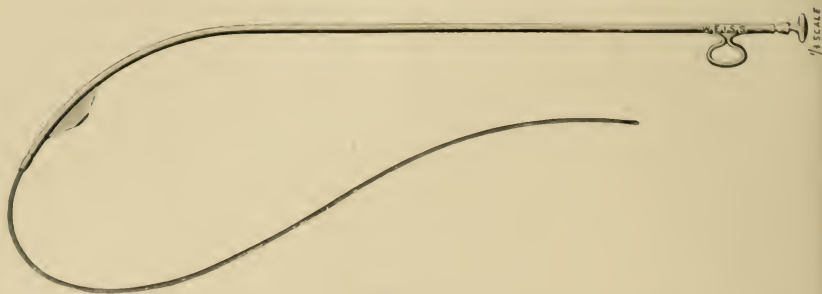


FIG. 19.

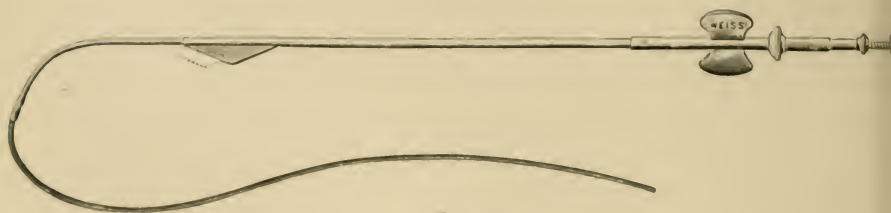


FIG. 20.

efficient for dividing the stricture from before backwards. A filiform flexible bougie, provided with a female screw at its base, is first introduced through the stricture into the bladder. The thin steel grooved staff is screwed on to this. The conducting staff is passed on through the stricture, preceded by the filiform bougie, which curls up in the bladder. The conductor is held steady by an assistant. The sheathed blade is now inserted in the groove of the

metal conductor, and pushed along till the sheath is obstructed by the anterior surface of the stricture, when the sharp blade is boldly projected against it by means of the button at the end of the handle, cutting partly through the morbid tissue, and then allowed to recoil back into the sheath, which it does by the force of a spring in the handle. The sheath is again pushed further home and the blade is once more projected, and so on till all resistance ceases, the stricture or strictures being cut through. Care should be taken that the blade is not pushed as far as the prostate and the latter incised, or severe bleeding may ensue. The instrument is then withdrawn, followed by the filiform guide.

The introduction of steel dilators, to ascertain if the morbid structures have been divided, and the subsequent proceedings, are the same as already described in Civiale's method.

As a rule, an anæsthetic should be given for internal urethrotomy; but when this is contra-indicated the operation can be performed without one, with the aid of a 5 per cent. solution of cocaine injected into the urethra beforehand.

The patient must be prepared for the operation. He should remain in bed for a few days beforehand. The kidneys must be working actively, and the urine be free from albumin. The bowels should be opened daily by saline laxatives. If the urine be alkaline, it must be rendered acid by the administration of $7\frac{1}{2}$ grains of urotropine or 10 grains each of boric acid and benzoate of ammonia three times daily. All febrile disturbances must be subdued. Urethritis, if present, must be allayed.

To obviate the occurrence of 'urethral' fever, the operation room should be well warmed and the patient's limbs swathed in flannel, and on transferring him to bed a hot-water bottle should be placed at his feet. On recovery from the anæsthetic he should have a draught containing 5 grains of

quinine and 15 drops of liquor opii sedativus. Indeed, for a few days before and after the operation I am in the habit of giving 10 grains of quinine daily in divided doses.

The patient is encouraged to drink freely of barley-water for several days, after the sickness due to the anæsthetic passes off.

In spite of all precautions, however, in a considerable proportion of cases of internal urethrotomy, an attack of so-called 'urethral' fever will occur within the first three days after the operation, usually immediately after the first act of micturition after the removal of the catheter. The cold, hot, and sweating stages of malarial fever are exactly reproduced, the temperature generally rising to 103° to 105° F. After considerable experience in India and in this country, I am unable to detect any difference in the symptoms and progress between a typical attack of urethral fever and one of the true malarial intermittent type.

Attacks of this fever are much more common after internal urethrotomy in Europeans who have resided in malarial countries than in those who have never left Europe.

What the cause of 'urethral' fever may be—whether due to septicæmia, disturbance of the central nervous system from urethral irritation, or to congestion and inhibition of the functions of the kidneys through shock of the operation—it is difficult to say. The subject is too abstruse and complicated as one to enter on here. The occurrence, though distressing to the patient and alarming to the inexperienced surgeon, is practically devoid of danger, provided the kidneys do not cease to work. Suppression of urine is a very serious complication, and always indicates the previous existence of diseased kidneys.

The treatment of 'urethral' fever is the same as that of malarial fever; warm clothing, warm drinks, and hot-water

bottles in the cold stage, diaphoretics and diuretics during the hot, and avoidance of chill during the sweating stage. It is only when the temperature returns to normal that quinine should be administered.

The patient must remain in bed for nine or ten days, after which he may recline on a sofa; but he should not leave his room for a fortnight after the operation. During the first four days he must not even go to the nightstool, for fear of inducing hæmorrhage by the erect position.

The bleeding of the operation is, as a rule, of a trifling character, and consequently in the vast majority of cases no special measures are necessary for preventing this, beyond insisting on the patient remaining in the horizontal position for several days. Should there be a tendency to hæmorrhage, this will generally be arrested by the presence of the stiff gum-elastic cylindrical catheter. Should this be insufficient, a hard pad should be applied to the perineum—it is in the bulbous portion only that hæmorrhage of any consequence takes place—and braced tightly there by an ordinary pair of trousers-suspenders passing over the shoulders. In one case only in my practice have I found these measures insufficient—a patient whom I only discovered after operation to be the subject of hæmophilia, in whom the incision was made on the roof of the urethra by Tevan's urethrotome. In this case I had to open the urethra through the perineum on a staff and tie a hard rubber perineal tube in the bladder for four days. This effectually controlled the bleeding, and the patient made a good recovery.

No instrument should be introduced till the wound has healed—that is, till about a fortnight after the operation, when it will be found that, as a rule, steel dilators, Nos. 22 to 26 F. (13 to 15 E.), can be introduced consecutively with ease, without the employment of any force. The patient should be taught to pass these instruments himself, fort-

nightly at first, and then at increasingly distant intervals, lest the stricture should show a tendency to recontract.

In accordance with the teaching of Sir Henry Thompson and others, I was formerly in the habit of introducing instruments through the stricture every second day after the third or fourth from the operation, with a view to keeping the wound open during the healing process. I have for some years abandoned this practice. Not only did it cause the patient much pain and induce urethral fever, but it actually defeated the object for which it was employed—viz., the prevention of recontraction, by inducing irritation of the wound and healing by granulation.

I hold that, when the ring of fibrous tissue which constitutes the chief element in stricture is thoroughly cut through in one direction, this more or less elastic band opens out; the cut ends separate, leaving a wide gap between them; free passage is made for the flow of urine; and the plastic inflammatory effusion in and around the scar-tissue becomes gradually absorbed by a natural process, when the source of irritation—viz., the forcible current of urine against the posterior aspect and edges of the narrow opening—no longer exists. At any rate, I submit that if—as I am constantly verifying in practice—at the end of a fortnight the full-sized instruments I have described can be passed with facility and without pain, their repeated employment before this, with the pain and fever caused thereby, is unnecessary and mischievous.

What are the relative advantages of these two methods of performing internal urethrotomy?

1. By the Tevan-Maissoneuve urethrotome any stricture, no matter how tight, provided we can pass the filiform guide through it, can at once be operated upon; whereas for Civiale's the stricture must be capable of admitting a No. 10 F. (5 E.) bougie, the size of the bulb of the instrument. A

stricture can, however, as a rule, be enlarged to this extent by 'continuous dilatation' in two or three days.

2. Civiale's method is much less liable to be followed by hæmorrhage than Maissoneuve's, owing to the incision being on the floor of the urethra, which is much less vascular than the roof.

3. In the after-treatment it is easier to introduce metal dilators when Civiale's method has been employed, owing to the naturally even upper surface of the urethra being left intact, so that the point of the dilator can be kept in this direction as it passes along the canal; whereas after the Maissoneuve operation there is often a pit left at the seat of the scar in the roof, in which the point of the dilator is liable to hitch.

4. Tough fibrous bands are cut with more certainty by Civiale's instrument in drawing the blade rapidly through the stricture from behind forwards, than by Tevan's, in which the blade is pushed gradually backwards.

5. When the case is complicated by false passages, or the stricture is very tight, it may happen that there may be some uncertainty about the guide being in the bladder; but with Civiale's instrument, the stricture being partially dilated, its end can be felt free in the bladder.

6. The blade of Civiale's urethrotome is completely under control at any stage of the operation, and can be projected to any desired extent, which is not the case with Tevan's.

Both operations are thoroughly sound and practical. I usually employ Civiale's, regarding it as having superior merits.

Internal urethrotomy, when undertaken in suitable cases and the morbid tissues thoroughly cut through, I consider one of the safest and most important operations in surgery. I have performed it in some 650 cases with seven deaths—four from suppression of urine and three from pyæmia. By

no other method of treatment are such permanent results obtained.

The question is frequently asked, Is stricture capable of permanent cure? My reply is emphatically in the affirmative. In a large proportion of strictures treated by internal urethrotomy, if that operation be properly performed—that is, if the morbid tissues be thoroughly divided—a permanent cure ensues. ‘Once a stricture, always a stricture,’ is a stock phrase handed down from the older surgical writers; and no doubt in the days of caustics, divulsion, and other imperfect methods of treatment, it contained a strong element of truth, as it did even in comparatively recent times, when the strictures were only cut up to 11 or 12 of the English scale. The morbid tissues, being only partially divided, rapidly recontracted, unless kept open by the constant passage of bougies. Otis laid the foundation of modern practice when he demonstrated the large natural capacity of the urethra. For some twenty-four years, since I adopted litholapaxy and fully recognised the large calibre of the urethra, I have been in the habit of dividing the stricture freely in the manner I have described. Patients operated on by this method years ago from time to time turn up to see me, in whom I can find no trace of stricture, though all instrumentation has been abandoned. As, however, in a large proportion of cases dealt with it is impossible to feel certain that every strand of fibrous tissue has been divided, it is advisable to introduce full-sized instruments at increasingly distant intervals for some time after the operation. When to abandon the practice is a nice question. The patient himself will generally solve it by ceasing to do so, when he finds that after lengthened intervals the instruments pass with ease.

External Urethrotomy.

This procedure consists in division of the stricture from without by means of a dissection carried down to the urethra from the perineum.

There are two distinct methods of accomplishing this, suitable, respectively, to different varieties of stricture.

1. That generally known as *Wheelhouse's operation*, employed when no guide or staff can be passed through the stricture. The urethra is opened in front of the contraction, the orifice searched for, and the morbid tissues divided on a director.

2. That in which the stricture is divided on a staff previously introduced through it.

The varieties of stricture in which this procedure is called for are :

1. 'Impassable' strictures.
2. Cases complicated with urinary fistula, with inflammatory thickening of the perineum and perhaps scrotum.
3. Tight strictures accompanied by chronic cystitis with foul, alkaline, purulent urine.

In the previous lecture I described the various manipulations and artifices to which it may be necessary to have recourse in order to enable us to introduce an instrument of some kind through a tight or complicated stricture into the bladder. It is possible, however, that in spite of all the skill and patience we can bring to bear on the case we may fail to accomplish our object. We are then in the presence of what is termed 'impassable' or 'impermeable' stricture.

In proportion to the skill and experience of the surgeon will such cases be rare. Syme, indeed, laid down dogmatically that there is no such thing as an impassable stricture. He did not, of course, include that condition we occasionally, though rarely, meet with — complete obliteration of the

urethra, which sometimes occurs after an accident in which the canal is lacerated or completely divided. But he maintained that, given the requisite skill and perseverance, an instrument can be introduced through any channel by which urine issues, even in drops. I thoroughly endorse this view under the conditions laid down. It must be remembered, however, that few surgeons are possessed of that experience and skill that will enable them to successfully manipulate an instrument through a tight and complicated stricture in all cases. Furthermore, even in the most accomplished hands, the patient will not always consent to lie up for the lengthened period—perhaps a couple of weeks—that the surgeon may be engaged in essaying to accomplish this difficult task. We must therefore reckon on occasionally coming across a case

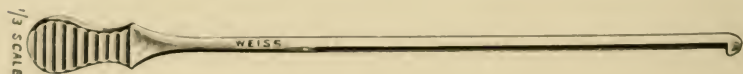


FIG. 21.

of stricture which is practically 'impermeable,' at least to the instrument of the surgeon.

In cases of this kind we must have recourse to external urethrotomy without a guide, or 'perineal section,' as it was formerly termed.

The procedure generally adopted in this country is that of Wheelhouse, who invented a special staff (Fig. 21) for this purpose. This staff, which is straight, is grooved on one side to within a fourth of an inch from the end, where a small blunt beak or button projects on the other side.

The hair of the perineum having been previously shaved and the patient prepared, he is placed in the lithotomy position. The staff is passed as far as the stricture, with the groove directed towards the perineum, and held steadily by an assistant. The tip of the staff is felt for, and an incision

about 2 inches long made in the median raphé, its centre corresponding with the bulb of the staff, and the urethra is opened for the extent of an inch in front of the stricture. The edges of the wound are held aside by catch-forceps, or by a loop of silk passed on either side through the margins of the urethra. The beak of the staff is then turned round and the upper end of the incision hooked up by it. All bleeding having



FIG. 22.

been arrested and the wound carefully sponged, the face of the stricture comes into view, and the opening is searched for, and, when found, a small probe-shaped director (Fig. 22) is pushed through into the bladder. The stricture is cut on its under aspect by passing along the director a long narrow knife. The beak of a small blunt gorget (Fig. 23) is inserted in the groove of the director and guided thus into the bladder.

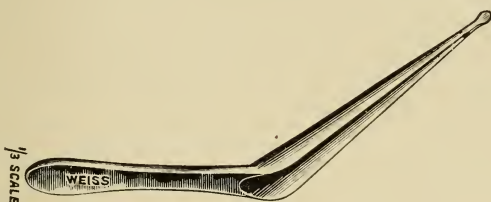


FIG. 23.

The staff, forceps, and director are removed, and a stout flexible catheter, No. 12 English scale, introduced through the urethra and along the gorget into the bladder, in which position it is fixed. Over this the edges of the wound are partially closed by silkworm sutures, and the dressings applied.

The catheter is retained for three or four days, or longer

if it does not cause irritation, the urine flowing thereby. After its removal a full-sized steel dilator is introduced every second or third day whilst the wound is granulating, and at more distant intervals when it completely closes.

This is a sound operation. It is sometimes a difficult one, requiring much patience, owing to the trouble that may arise in finding the orifice of the channel through the stricture. A good light is essential, and all oozing of blood must be subdued before searching for the orifice. After this is found there may be difficulty in introducing the probe. One is, as a rule, inclined to hold the probe too vertically: if held rather horizontally, it will slip through more readily.

Formerly I always employed the instruments used by Wheelhouse, but for several years past I have carried out this operation with somewhat different implements. I employ

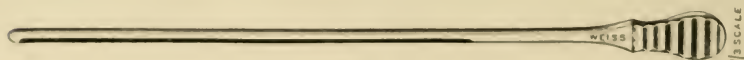


FIG. 24.

a straight staff (Fig. 24), grooved almost to the end, without any button. When the urethra is opened, this is laid aside. A flexible bougie is passed by the urethra till half of it projects through the wound. This latter half is then bent up outside the scrotum and penis, and both ends are held by an assistant. A loop is thus formed by the bougie, which holds the upper end of the wound steady—more than can be said of Wheelhouse's staff, which is constantly slipping, the beak being too small to grasp the tissues boldly.

I have had filiform guides made to screw on to the probe-director (Fig. 25). The fine flexible guide is first introduced through the stricture, the director is screwed on and passed after it, the guide curling up in the bladder. It will frequently be found that a fine flexible guide traverses a tight stricture more readily than a probe.

Syme's operation consisted in introducing a fine grooved staff (Fig. 26) through the stricture, and cutting down on this from the perineum, the stricture being thus divided. The subsequent proceedings were the same as those already indicated in dealing with the preceding operation. The staff had a shoulder which rested against the face of the stricture, thus indicating its locality.



FIG. 25.

This operation was introduced by Syme for the purpose of dealing with all strictures that were not amenable to treatment by dilatation. As, however, the vast majority of these cases are now best dealt with by internal urethrotomy, Syme's operation has lost its *raison d'être*, and is practically obsolete.

External urethrotomy on a staff previously passed through the stricture is now only employed for cases complicated with



FIG. 26.

bad urinary fistulæ, or when drainage of the bladder through the perineum is necessary.

Author's Operation.

The following is the method of performing external urethrotomy which I myself practise when the stricture is traversable by an instrument.

The patient being anæsthetized and placed in the lithotomy position, if the stricture be a tight one I commence by introducing a flexible filiform guide, on to which is screwed a fine conical steel dilator (Fig. 15), No. 2 English scale. This is passed on after the guide, which curls up in the bladder. The steel dilator is then withdrawn and unscrewed, the guide being left in the stricture. The next larger-sized dilator is screwed on, and passed as before; and so on, rapidly dilating the stricture till a fairly large-sized dilator—say, 6 or 8 E.—is reached, when the staff (Fig. 27) is screwed on to the guide and introduced into the bladder.

These staffs I had specially constructed with a short curve

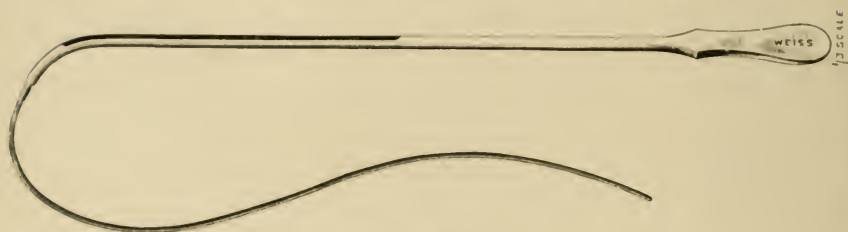


FIG. 27.

and tapering beak, a female screw being drilled in the end for the reception of the male screw of the guide.

If the stricture admit a fairly large staff without dilatation the above preliminaries are, of course, unnecessary, and the staff is passed forthwith.

An incision a couple of inches long is then made in the median raphé over the site of the stricture, the dissection rapidly carried down through the perineum as far as the staff, and the stricture divided freely. The fistulæ are scraped, and all sinuses that communicate are laid open, their margins being scraped, or clipped off with scissors if ragged and unhealthy. A blunt gorget is then passed along the groove in the staff into the bladder to facilitate the introduction of the catheter, and the staff with the attached guide withdrawn.

The tying in of the catheter and subsequent proceedings are the same as described in the previous operation.

When stricture is complicated by chronic cystitis with purulent ammoniacal urine, with or without the existence of urinary fistulæ, the bladder must be drained through the perineum. A small incision about an inch long and an inch in front of the anus is made in the raphé down to the staff. This incision should, if possible, be in healthy tissue and not involve a fistula. Through this a blunt gorget is passed along the groove in the staff into the bladder, and the staff withdrawn. A stout hard rubber perineal tube (Fig. 28) is then introduced along the gorget into the bladder and the latter withdrawn. A rush of foul urine will take place through the tube as soon as it reaches the bladder, which



FIG. 28.

is washed out with boric lotion. It will in most cases be advisable to withdraw the tube in order that the finger may be inserted into the bladder to explore for stone; for in cases of this kind it will frequently be found that a soft phosphatic concretion is present. This, if it exist, being removed, the tube is reintroduced, and fixed in by means of a suture through the edges of the wound. The fistulæ and sinuses, if present, are treated as already described. The dressings having been applied, the urine is conducted by a rubber tube, attached to the perineal tube, to a vessel beneath the patient's bed.

As to the treatment of the stricture, three courses are open to us:

1. To extend the perineal incision and at once divide the stricture.

2. To deal with it by internal urethrotomy.
3. To leave it for subsequent treatment by dilatation.

If the stricture be single, tight, and deeply placed, it should be dealt with at once by extending the incision, so as to divide it thoroughly.

If multiple, the deep stricture can be dealt with by external urethrotomy, and the penile one by internal urethrotomy at the same time.

If single and not very narrow it is best left alone, and subsequently treated by dilatation. It will be found in such cases that when the urine is carried off by the perineal drainage-tube the inflammatory thickening in and around the stricture will rapidly subside. Absorption of the morbid products takes place, so that after ten days or a fortnight a good-sized steel dilator can be introduced with facility, and the stricture dilated by the gradual method. I have frequently verified this in practice, even when the stricture is comparatively narrow—thus affording another proof that true absorption of the morbid products of stricture does take place, when the friction and irritation caused by the flow of urine against its contracted margins are removed.

The bladder should be washed out daily with boric or weak permanganate of potash solution, and the perineal tube not finally removed till the fistulæ have quite healed, when the artificial fistula—the track of the drainage-tube—is allowed to close, steel dilators, of course, being periodically introduced.

This is sometimes a tedious process, this fistula remaining open for months, and requiring to be stimulated from time to time by the electric cauter. I cannot at all endorse the light-hearted manner in which some surgeons write about external urethrotomy. In fact, I regard this operation as a necessary evil, to be had recourse to only when other measures fail or are found impossible.

Urethrectomy.

This operation consists in total excision of the morbid tissues which constitute the stricture. It is employed for traumatic strictures which are found intractable to other forms of treatment.

The preliminary stages of the operation are the same as for external urethrotomy when no staff can be passed through the contraction. When the face of the stricture is exposed a metal probe is introduced through its opening in the manner already indicated when dealing with external urethrotomy. The ring of scar-tissue is then resected by means of blunt-pointed scissors curved on the flat, the cylindrical section of the urethra involved in the stricture being completely removed. The severed ends of the urethra are brought together by sutures. The edges of the upper aspect of the urethra are first approximated by means of two or three catgut sutures passed through the mucous membrane and submucous tissues and tied within the canal. A gum-elastic cylindrical catheter, No. 12 English scale, is then introduced through the meatus as far as the bladder, and secured there. Outside this the margins of the sides and floor of the urethra are brought together by fine silk or catgut sutures passed through the submucous tissues after the manner of Lembert's sutures—not entering the canal. The surfaces of the perineal wound are then brought together over all by means of silkworm-gut sutures, when the operation is completed, and the dressings applied.

The catheter should not be removed for three or four days, when it is replaced by another of similar size, very gently introduced, after irrigation of the urethra to remove any mucoid discharge that may be present. This second catheter should be removed on the third or fourth day; also the superficial sutures from the perineum, when union should

have taken place. A steel dilator is passed once a week at first, and then at more distant intervals.

This operation is only practicable when the stricture is situated in the perineal portion of the urethra, where the traumatic variety usually occurs, as it is only here that the submucous tissue is sufficiently extensible to permit of the mucous membrane moving on it to such an extent that the severed ends of the urethra can be approximated without any tension being placed on the sutures. It is only applicable when the length of the stricture is not more than half an inch. The presence of pus in connexion with the stricture also renders the prospect of success of this operation doubtful.

I have undertaken this operation in several cases, sometimes with complete success, sometimes with indifferent results. It is surprising the ease with which the ends of the divided urethra can be approximated without any undue tension on the sutures. The main causes of failure are the difficulty of excluding pus—which is almost invariably present at the site of the stricture—from the wound, and the danger of urine passing beside the catheter, thus infecting the wound.

I will, in conclusion, briefly allude to two other methods of treating stricture which at different periods in the past enjoyed considerable popularity, but which have now almost vanished from practice—I refer to ‘divulsion’ and ‘electrolysis.’

Divulsion.

The first of these methods was best known in this country as ‘Holt’s operation,’ and consisted in rupture of the stricture by forcibly separating the two blades of a split sound, introduced through the canal, by means of a wedge rapidly advanced between them. This operation has now disappeared from practice owing to (1) the difficulty in restricting the

splitting process to the strictured portion of the canal, extensive laceration of the healthy mucous membrane frequently taking place; (2) the shock caused to the system inducing rigors and suppression of urine more frequently than by any other method of treatment; and (3) the rapidity with which recurrence of the contraction took place.

Electrolysis.

The electrical current has been employed with a view to inducing decomposition of the morbid tissues of stricture by electrolysis. Great results were anticipated from this process at first; but in late years it has fallen into abeyance, the results having been found to be only temporary. Instruments of gradually increasing size are passed through the stricture for the conveyance of the electrical current; and it is now recognised that to the dilatation thus induced, and not to the electricity, was due the temporary improvement that took place.

LECTURE IV

THE URETHROSCOPE—THE CYSTOSCOPE—CATHETERISATION OF THE URETERS—THE URINE SEPARATOR

IN the foregoing lectures I referred to the employment of the urethroscope in the diagnosis and treatment of stricture of the urethra. And just now I have given you a practical demonstration of the value of the cystoscope, by revealing to you in this patient, without the aid of any anæsthetic, the presence of a pedunculated growth in the bladder, which several of you have seen as clearly as if it had been placed without the body. As I shall frequently have to refer to this latter instrument, it will be convenient at this stage to direct your attention to the means and methods of diagnosis which in recent years have been placed within our reach through the employment of the electric light for illumination of the urinary passages.

The Urethroscope.

By means of this instrument the urethral canal can be illuminated throughout the greater part of its extent to such a degree that the colour and general conformation of the mucous membrane become clearly visible.

There are several varieties of the instrument in the market. This which I show you (Fig. 29), by Schall, is light and handy, and gives as clear a picture as any of them.

The lantern (A) contains a small Edison lamp, mounted on a cylindrical movable socket (B), and a lens, by which the rays of light are reflected along a metal tube (H) passed into the urethra.

The light in this instrument, it will be observed, is placed without the body. Several attempts have been made to illuminate the canal by means of lamps passed inside the urethra, but hitherto without much success.

The urethral tubes are made of bright polished metal, and are cylindrical in shape. They vary in size from 20 to 28 of

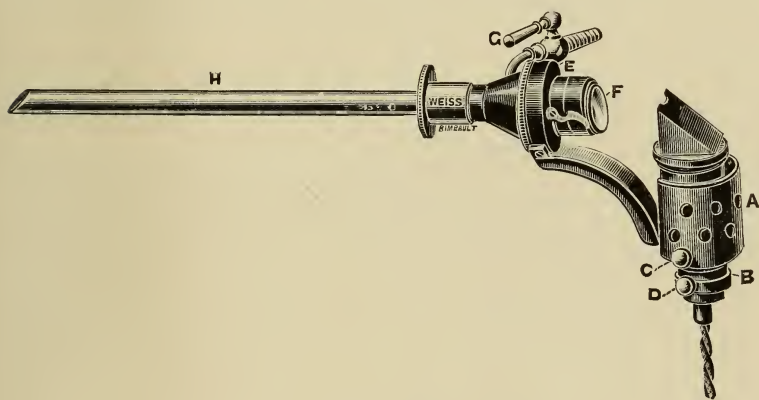


FIG. 29.

the French scale. For examination of the urethra as far as the membranous portion the tubes are straight (Fig. 30); for use in the prostatic portion of the canal they are curved (Fig. 31), with a large oval opening on the convexity. Each tube is supplied with an accurately fitting conductor.

To the tube-holder (E) is fitted a glass window (F), which is air-tight when closed, and a narrow hollow stem, with stop-cock (G), for the reception of india-rubber bellows. By this means the canal can, when necessary, be inspected when distended with air.

The urethroscopic armamentarium further includes tampon-

holders, insufflators, curettes, probes, knives, scissors, and snare for polypi.

Before using the urethroscope it is necessary to make sure that the lamp is in the focus of the lens, otherwise the illumination will be defective. A piece of white paper is placed



FIG. 30.



FIG. 31.

against the wall, and the end of the tube directed towards this (Fig. 32). The socket holding the lamp is then moved up and down in the lantern until an intense circular light is thrown on the paper, when the socket is clamped in position by a screw (c).

Before examination the patient is directed to micturate, and if the urethra be very sensitive a 2 per cent. solution of

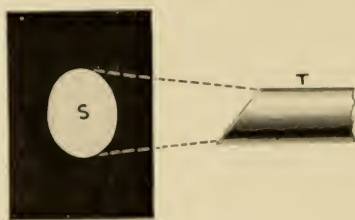


FIG. 32.

cocaine is injected into it. A tube armed with its conductor is selected that will readily pass through the meatus and along the urethra without causing pain. It is lubricated with glycerine and slowly introduced as far as the bulbous portion of the urethra, when the conductor is withdrawn. A

pledget of cotton mounted on a holder is passed along the tube, and any mucus lying there is gently mopped up. The urethroscope is then adjusted to the tube, and the light switched on by the screw (D), when the mucous membrane at the end of the tube comes clearly into view. The larger the tube, the more extensive the field brought into view, and the more distinct will the picture be.

The tube is then slowly withdrawn in the axis of the urethra, and the changing appearance of the mucous membrane noticed along the canal as far as the meatus. The picture presented to the eye in the normal urethra will be a central depression, with minute folds of mucous membrane radiating from it all round, the whole surface being moist and glistening. The colour of the mucous membrane varies in the different parts of the canal. Near the bulbous portion it will be dark pink, approaching red, then shading off to salmon colour in the centre of the penile portion; whilst in the 2 inches behind the meatus it will be yellowish white. The fine network of bloodvessels will generally be distinctly visible, as also the lacunæ of Morgagni, as minute longitudinal depressions.

Any deviations from these appearances will be abnormal, but when any pressure is used in the introduction of the tube, alterations in the sensitive mucous membrane will take place, giving rise to hyperæmia and changes in its lustre and colour. Allowance must be made for these changes in drawing conclusions as to the nature of the phenomena seen. These drawbacks are slight when dealing with the penile portion of the urethra, but when the curved tube is passed through the membranous into the prostatic portion, bruising of the parts with resulting congestion and frequently bleeding occur; so that our conclusions drawn from inspection of this part of the canal are rarely of much value, unless some specific object, such as papilloma, be present.

By this instrument we can recognise and locally treat the various forms and results of chronic urethritis, chancres, ulcers, polypi, papillomata, strictures, etc.

For rendering the lamps in the urethroscope and cystoscope incandescent 8 to 12 volt batteries (bichromate or dry Leclanché) are employed: or the current from the main, reduced by means of a transformer, can be utilized; or an accumulator may be used for this purpose. The transformer is the most useful in the consulting-room or hospital where

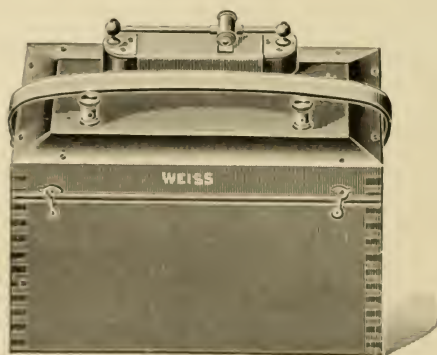


FIG. 33.

the main is available. I find an eight-celled dry Leclanché battery (Fig. 33) the most convenient and trustworthy for travelling.

The Cystoscope.

To the inventive genius of Professor Nitze and Mr. J. Leiter, the instrument-maker of Vienna, we owe the cystoscopes now almost universally employed. That in use for several years (Fig. 34), with some important modifications to be presently described, consists of a metal tube, bent near the end at an obtuse angle, resembling somewhat a bladder sound in shape. The bent portion, or beak, consists of a

cylindrical cap, which can be screwed on and off the shaft at the elbow of the instrument, and is furnished with an oval rock-crystal window (E) on the upper or concave aspect. Encased in this metal cap and situated opposite the window is a miniature electric lamp connected with the end of the shaft, through which, inside the metal tube, run insulated wires to the connecting screws (C, C'). By the detachable nature of the beak the lamp, when defective, can be replaced by a new one in a few seconds. The arrangement as a whole forms a water-tight compartment for the lamp, which

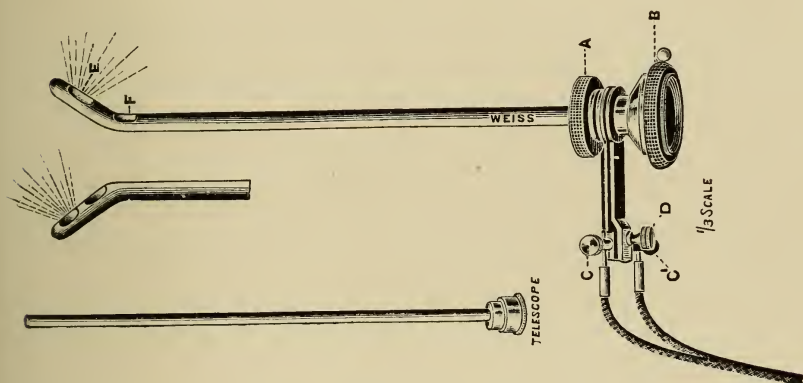


FIG. 34.

illuminates the bladder through the window without coming in contact with the fluid in which it must necessarily burn, in order to protect the bladder walls from injury. In the shaft just above the elbow is inserted a glass prism (F), by which the rays of light from the bladder are refracted along a telescope, inserted in the shaft and capable of being removed for the purpose of being cleaned or for use in another instrument. The rim of the ocular end (B) through which the observer looks is covered by a thin plate of ebonite, to prevent shock in case of contact of the eyebrows with the cystoscope. A knob (B) on the edge of the ocular end indi-

cates the aspect of the bladder towards which the beak and prism are directed from time to time. By means of a screw (D) the circuit can be closed and opened. This screw, together with the connecting screws, are carried on a rotatory plate or swivel, so that with the finger and thumb of one hand placed on the cylinder (A) the beak of the instrument can be revolved so as to bring any part of the bladder into view, while the connecting cords remain in position, being held downwards by the other hand.

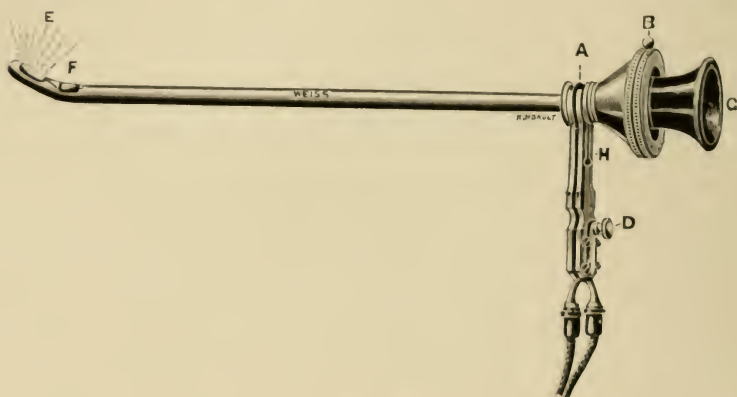


FIG. 35.

In the most recent form of cystoscope (Fig. 35) a 'cold' lamp is used, and this is fixed in the beak; so that when a lamp is destroyed the beak is simply replaced by a fresh one with its contained lamp. This 'cold' lamp when burning in air can be touched by the fingers, whereas the ordinary lamp only keeps cool when burning in fluid.

A metal cap screws on to the ocular end, protecting the telescope, so that the whole instrument can thus be immersed in fluid for sterilization.

On removal of the cap, an eye-piece (G) is screwed on in its place, by which light is excluded when the eye is applied to the telescope.

The cords are permanently fixed to the rotatory plate, and connexion with the battery is effected by simply clipping this on to the cylinder (A).

These improvements, which have been introduced within the past three years or so, have rendered the cystoscope a much more safe and efficient instrument.

The standard cystoscope employed for adult males is in size 22 of the French scale, and with this a surface of 3 or 4 inches in diameter can be seen at one time. Cystoscopes are specially made larger, up to 40 of the French scale, for employment in females, giving a more brilliant illumination and bringing a larger surface into view at the same time. They are also constructed smaller for children, but the diminution in thickness of the instrument involves a rapid narrowing of the field of vision, as well as a darkening of the picture presented to the eye. Formerly a second instrument was employed, with the window on the under aspect of the beak, and a simple pane of glass in the convexity of the elbow, for the purpose of viewing the base of the bladder, and particularly the trigone; but this is now little used, as, since the introduction of the swivel arrangement referred to, all portions of the bladder can be brought into view by the instruments already described.

In cystoscopy the patient is most conveniently examined in the supine position on an ordinary operating-table, with his buttocks raised on a hard cushion and his legs slightly separated. The lithotomy position may also be employed, and is, perhaps, best for females. As a rule, a male requires an anæsthetic for careful and thorough examination, though sometimes this may be dispensed with, the urethra being locally anæsthetized by means of cocaine. An anæsthetic is rarely required for females, who, as a rule, feel no pain or inconvenience from the examination.

A clear fluid medium is, of course, necessary to obtain a

satisfactory view of the bladder and its contents. The best medium is the patient's urine, provided this be sufficiently clear; and this can frequently be attained by keeping the patient in bed for a few days previously to examination, and directing him to retain his urine for three or four hours beforehand, if possible. But if the urine be clouded with blood, pus, or muco-pus, it will be necessary to wash out the bladder through a soft catheter by means of warm boric lotion or boiled water. This should be done very slowly and gently, so as not to excite fresh bleeding. When the fluid flows quite clear, from 6 to 8 ounces should be introduced and left in the bladder. Glycerine should be employed for lubricating the catheter instead of oily substances, which would adhere to the windows of the cystoscope and obscure the view. Some diseased bladders resent the introduction of more than 3 or 4 ounces of fluid even under deep anæsthesia; but even this quantity may suffice to give us important information.

The cystoscope should be examined beforehand to ascertain that it is in working order, and that the illumination is of the proper strength. It is rendered aseptic by thorough washing with soap and warm water, and immersion in warm carbolic lotion. It is then smeared with glycerine and introduced like an ordinary sound, very slowly and gently, to avoid even the slightest bleeding, if possible, and pushed as far into the bladder as the rim will permit. Care should be taken that the light is switched off before introduction of the cystoscope.

The observer's eye is now applied to the ocular end, and the light is switched on, when the bladder will suddenly appear illuminated. The beak being directed upwards, the first portion of the bladder that comes into view is the apex, and if a growth has its origin in this position, which is rare, it will be observed at once. If the medium be quite trans-

lucent, the surface of the bladder will be seen as clearly as if it were exposed to broad daylight, corrugated more or less according to the quantity of fluid introduced, greyish white, with the minute bloodvessels visible, the general appearance recalling that of the retina as seen through the ophthalmoscope.

A methodical survey of the bladder is now made. It is best in the first instance to bring the ureteral opening on one side into view, and then that on the other side—small slit-like openings, placed obliquely, directed downwards and inwards, at the extremities of the interureteral bar. These objects afford landmarks from which we take our bearings in surveying the bladder. In the vast majority of instances tumours, if present, will be found in their vicinity. The cystoscope should then be withdrawn till the prism approaches the neck of the bladder, the collar of which will be recognised by its dark crimson colour and smooth, rounded edge, and a complete revolution of the beak slowly made in this position. Similarly, the fundus is examined by pushing the cystoscope in as far as the rim will permit and revolving it in this position. The beak must not be allowed to remain in contact with the bladder wall at one point for more than a few seconds, for fear of scorching the mucous membrane, but kept constantly on the move, the light being periodically switched off for a few seconds to cool the lamp. Before withdrawal of the cystoscope from the bladder the light should be switched off for half a minute to avoid burning the urethra. To make assurance doubly sure in this respect I always detach the connecting cords from the instrument before its withdrawal. The fluid is then drawn off by a catheter, when the examination is completed.

It is impossible in a lecture of this kind to teach all the details necessary for a successful cystoscopic examination and a correct appreciation of the appearances observed.

These can only be acquired by practice, and are best learnt under the guidance of an experienced cystoscopist. It must be remembered that objects are greatly magnified when close to the prism.

Should there be bleeding during the examination we may be unable to obtain a clear view, or merely for a short time, so that it may be necessary to withdraw the cystoscope and to wash out the bladder once more till the fluid runs clear. Should the bleeding still continue it will be necessary to postpone the examination to a future date, the patient being kept quiet in bed in the meantime, and the re-examination undertaken when bleeding has quite ceased.

Apart from the diagnosis of tumours of the bladder, which may be regarded as the chief function of the cystoscope, this instrument is now employed in clearing up the nature of many other obscure diseases of the urinary tract—viz., (1) hypertrophy of the prostate, to ascertain the extent and nature of the outgrowth in the bladder; (2) encysted calculus of the bladder; (3) tuberculosis of the bladder; (4) chronic ulcer of the bladder; (5) foreign bodies in the bladder; (6) hæmorrhage or discharge of pus from one or both ureters in various diseases of the kidneys; (7) stone impacted in the lower end of the ureter in its descent from the kidney; and (8) to ascertain the conformation of the ureteral openings in certain diseases of the kidneys.

Catheterisation of the Ureters.

This modified cystoscope (Fig. 36) is employed for catheterisation of the ureters, and thus drawing off the urine from each kidney separately. By analysis of the separate secretions we can ascertain the relative efficiency of the kidneys—a matter of vital importance, as we shall see later on, when we come to the consideration of operative interference on these organs.

The cystoscope armed with the catheter (L) is introduced into the bladder as already described, and rotated towards the trigone till the ureteral opening is brought into view. The catheter is then pushed on till it is seen projecting in the bladder. By rotating the little wheel (K) the end of the catheter is elevated from the plane of the axis of the instrument till its point is placed opposite the ureteral opening, and it is then pushed onwards into the ureter till it reaches the renal pelvis, when, after a short time, urine

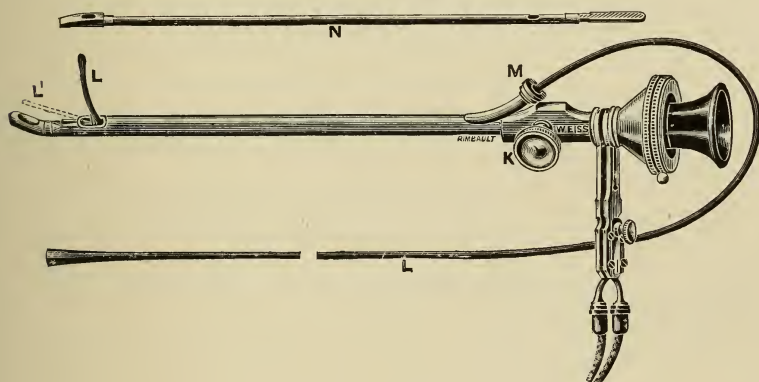


FIG. 36.

begins to trickle out of the external end of the catheter, and is collected in a glass vessel placed for that purpose.

In some cases catheterisation of the ureters is easily accomplished. In others, considerable manipulation is required in rotating the wheel to the necessary extent, and at the same time advancing and withdrawing the catheter, before the catheter is engaged in the ureteral canal, when, as a rule, it glides onwards without difficulty, the progress of the catheter, which appears greatly magnified, resembling that of a worm burrowing in earth.

In the female an anæsthetic is rarely required for this operation; in the male frequently so.

My friend, Mr. J. H. Willan, formerly House-Surgeon, St. Peter's Hospital, and now of Newcastle-on-Tyne, has invented an ingenious addition to the cystoscope, for the purpose of keeping the catheter aseptic during its introduction (*vide* the *Lancet*, May 4, 1907).

The Urine Separator.

It will be convenient to refer here to another method of collecting the urine separately from each kidney. This instrument (Fig. 37) has been devised by Dr. George Luys, of Paris, for this purpose. It is shaped somewhat like a

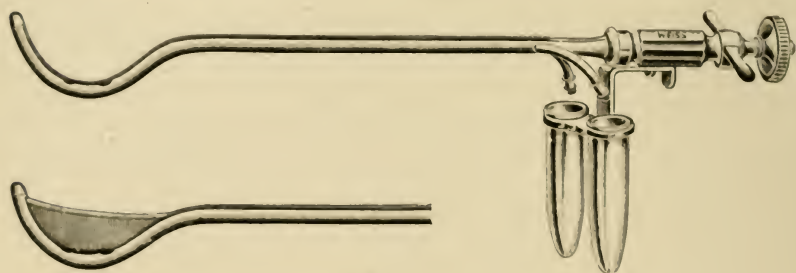


FIG. 37.

bougie, with a peculiar curve, like that known in France as the Béniqué pattern. When introduced into the bladder a wheel at the end of the handle is rotated, and by this means a thin rubber septum is projected, by which the bladder is divided into two lateral compartments. The urine secreted from each kidney flows through a catheter placed on either side of the central metal septum of the instrument, and is collected in glass tubes.

I have seen my friend, Dr. Luys, employ this apparatus very skilfully and effectively at the Lariboisière Hospital; but after a considerable trial I cannot say that I myself have had much success with it. The mechanism is rather complicated, and unless great care is taken in the use of the

instrument it is liable to inflict grave injury on the patient. The great objection to this instrument, to my mind, is the presence of the chain for rendering the rubber septum taut. One trembles to think what would happen if this did not work properly when the instrument is in the bladder, before its withdrawal.

The instrument can only be of use in bladders of normal shape; it is useless in cases complicated by enlarged prostate, or when the bladder is sacculated or contracted.

Personally, I much prefer catheterisation of the ureters by the aid of the cystoscope for urinary separation.

A most interesting paper on this subject will be found in the *Lancet*, March 28, 1904, by Mr. R. A. Bickersteth, of Liverpool.

LECTURE V

ENLARGEMENT OF THE PROSTATE: ITS NATURE, PATHOLOGY, SYMPTOMS, AND DIAGNOSIS

TO-DAY I propose considering with you that condition commonly called 'hypertrophy of the prostate,' an enlargement of the organ incidental to declining years, and which frequently causes obstruction to the urinary flow. It is sometimes named 'senile' enlargement, a not particularly appropriate description, as the disease, if it occur at all, sets in long before senility in the general acceptation of that term supervenes, and one that men who have scarcely turned middle life sometimes resent as offensive. As the disease is not a hypertrophy as generally understood, perhaps the most appropriate description would be enlargement of the prostate of declining life; but for brevity we will refer to it simply as 'enlargement of the prostate.'

It will be convenient in the first instance to briefly recall some of the characteristic features of the healthy organ. The prostate is a glandular body which surrounds the neck of the bladder and the adjacent inch of the urethra. In the adult it is the size and shape of a chestnut, being about $1\frac{1}{2}$ inches broad, 1 inch long, and $\frac{3}{4}$ inch deep. Its average weight is $4\frac{1}{2}$ drachms. The base is directed backwards and upwards towards the bladder, the neck of which it embraces, and the apex forwards and downwards, touching the trian-

gular ligament. The posterior surface, which is smooth and slightly grooved in the middle line, rests on the rectum, from which it is separated by dense fibrous tissue, which forms part of the 'sheath' of the prostate.

The prostate consists of two lateral lobes, between which the ejaculatory ducts enter from behind, before opening into the prostatic urethra. A third, or 'median,' lobe was described by Sir Everard Home in the early part of last century as existing in the normal prostate, and this description has been almost universally accepted as correct, in spite of the fact that Sir Henry Thompson with great skill combated the existence of this lobe. Practical experience derived from numerous dissections of the healthy prostate and nearly 500 operations for removal of the enlarged organ entire in its capsule has convinced me that Sir Henry Thompson was correct in his views, and that the so-called 'middle' lobe is merely a pathological product, derived from one or both lateral lobes, and that it is non-existent in the normal prostate. There is, it is true, a median portion, or bridge of tissue, sometimes forming a rounded prominence, above the ejaculatory ducts in the normal prostate; but this is derived from both lateral lobes, which are in this position more intimately blended than in the rest of their course on either side of the prostatic urethra.

Structurally, the prostate is composed of glandular substance and a stroma made up of muscular and fibrous tissues. The glandular substance consists of follicular pouches with ducts lined with columnar epithelium. The excretory ducts, from twelve to twenty in number, open into the urethra beside the veru montanum. The muscle forms the bulk of the prostate, its supposed function being to eject the glandular secretion, or prostatic fluid, to mix with that from the ejaculatory ducts.

It is now recognised that the prostate is an accessory

sexual organ, its function being to secrete fluid to mix with the semen.

The prostate has a tendency to increase in size in a large proportion of men after the age of fifty, but the enlargement does not generally declare itself by any marked symptoms till after fifty-five years. This rule does not hold good in India, for it is generally recognised by surgeons in that country that decided symptoms of enlargement of the organ manifest themselves in natives as early as at the age of forty-five years. It must be borne in mind, however, that the expectation of life in Orientals is about ten years less than in Europeans—that is to say, a native of India is at forty-five years of age comparatively as old a man physically and sexually as a European is at fifty-five years. Even in Europeans we occasionally meet with instances of true enlargement at an earlier age; but they are not sufficiently numerous to invalidate the general rule laid down.

It is estimated from statistics collected by the late Sir Henry Thompson and others that about 33 per cent. of men beyond fifty-five years of age are subject to enlargement of the prostate, but that not more than 5 per cent. ever suffer from symptoms.

The overgrowth may be uniform in character, the hypertrophy extending equally to both lobes, the gland thus preserving its symmetry. But in the fully hypertrophied prostate, as will subsequently appear, the pyramidal contour of the organ becomes reversed—that is to say, whereas in the normal prostate the apex of the pyramid lies towards the triangular ligament and the base towards the bladder, in the hypertrophied prostate the base of the pyramid lies towards the triangular ligament, the apex being placed in the bladder. The manner in which this alteration in shape is gradually brought about during the process of enlargement of the organ will appear later on.

The two lobes may be unequally enlarged; indeed, one lobe may be enormously hypertrophied, the other remaining almost unaltered except as to the shape impressed on it by the bulk and pressure of the other lobe. The surfaces of the lobes may remain smooth and uniform, but frequently bossy outgrowths project therefrom. These outgrowths are always confined within the true capsule of the prostate; though, carrying the capsule before them, they may form polypoid-like outgrowths projecting into the cavity of the bladder and connected with the main body of the organ merely by narrow pedicles (Fig. 38, c, c', c'').

In size the enlarged prostate may reach from anything beyond the normal to that of an orange, or even a cocoanut. The largest prostate that I have removed (Fig. 37) weighed $14\frac{1}{4}$ ounces.

The urethra and bladder will be altered in shape in accordance with the size and form of the overgrowth. The prostatic urethra is invariably lengthened and may attain to several inches, so that 15 or 16 inches of catheter may be introduced before the urine begins to flow. When the lateral lobes are symmetrically enlarged, the urethra is compressed from side to side, and on section resembles a vertical slit. When one lobe only is enlarged, the urethra, being diverted to the opposite side, will be curved laterally. If there be a median outgrowth in the bladder, the urethra will be curved upwards towards the inner orifice; and if this be very large, pyriform, and projecting into the bladder, there will be a channel on either side, the urethra being Y-shaped. When the overgrowth assumes the form of a collar round the neck of the bladder, as it sometimes does, the urethra will necessarily be contracted at this situation.

The prostate being debarred from expansion below by the triangular ligament, in its enlargement it gradually advances upwards in the direction of least resistance. The urethra is

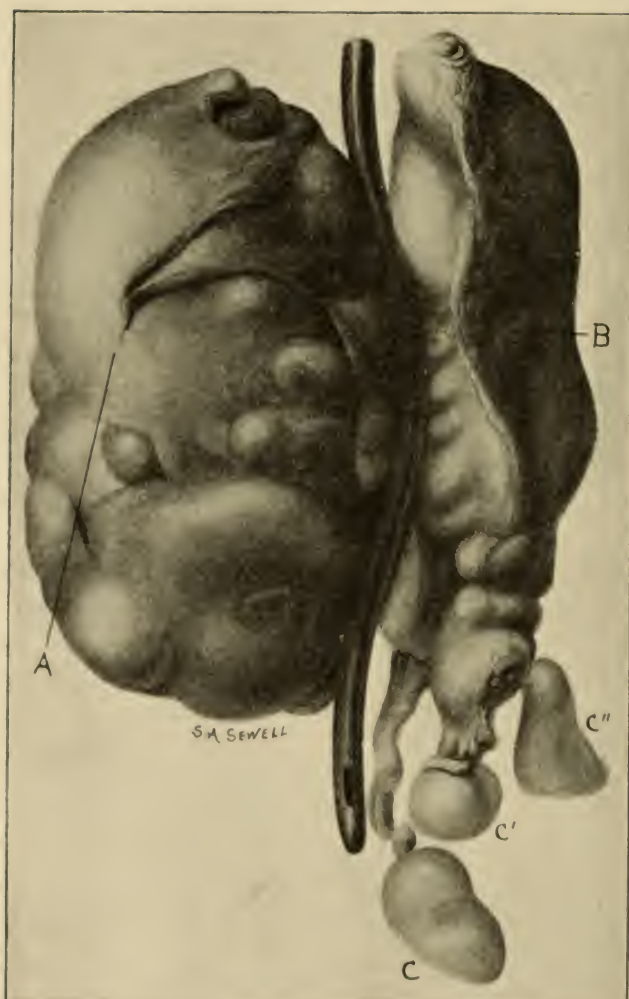


FIG. 38.—LARGE PROSTATE, WEIGHING 6 OUNCES, REMOVED FROM PATIENT AGED SEVENTY (CASE 7).

A, Left lobe enormously hypertrophied; B, right lobe, elongated, flattened, terminating in outgrowths, C, C', C'', in the bladder. The catheter lies in position of urethra, which was very tortuous.

carried with it, and the inner orifice placed on a higher level than the base of the bladder, which remains stationary. A post-prostatic pouch is thus formed in the bladder, which is never emptied of urine during the acts of micturition. This remaining quantity of urine, which is termed 'residual,' gradually increases in quantity as the hypertrophy progresses and the muscular power of the bladder diminishes, owing to the persistent overstrain that the organ is subjected to in order to overcome the obstruction to the flow of urine. In the early stages of the disease there is a compensatory hypertrophy of the bladder walls to overcome this obstruction, but in time, owing to the constant straining, dilatation ensues, so that the bladder may contain several pints of urine. The walls may become extremely thin, or muscular trabeculæ may develop, between which the mucous membrane bulges outwards, forming saccules of various sizes. In course of time changes occur in the ureters and kidneys from the backward pressure due to the obstruction of the urinary flow—changes similar to those taking place in connexion with stricture of the urethra. Hæmorrhoids and prolapsus ani also occur frequently in connexion with this disorder from the constant straining in micturition.

Theoretical Causes of Prostatic Enlargement.

Many theories have, from time to time, been put forward to account for the enlargement of the prostate peculiar to declining life, none of which, however, can be said to fit completely with all the phenomena attending this disorder. I shall confine myself to stating briefly some of the rival views.

Guyon and the French school generally maintained, at least till quite recently, that the enlargement of the prostate is not a purely local disease; that it is merely a local manifestation of a constitutional disorder which commences with

general arterial sclerosis and ends in fibroid degeneration; that the genito-urinary organs—prostate, bladder, ureters, and kidneys—are liable to undergo this change in a pronounced form, the muscular and glandular structures being replaced by dense fibrous tissue, but that these latter changes are never independent of general atheroma. The enlargement of the prostate and changes already described as taking place in the urinary tract behind are held to be coincident and not related to each other as cause and effect. It is pointed out in this connexion that all the symptoms commonly regarded as the result of hypertrophy of the prostate may occur when there is no enlargement of that organ, as a result of sclerosis of the bladder.

Against this theory it is urged, that the fact that atheroma and enlargement of the prostate occur together is no proof that the latter is the result of the former—as well might cancer and other diseases which are liable to occur during the atheromatous age be attributed to this degeneration; that enlargement of the prostate occurs when there is no such general atheroma of the system; that arterial sclerosis induces atrophy rather than hypertrophy; that enlargement of the prostate frequently commences before the atheromatous period; and that this enlargement always commences as adenomatous overgrowth, and not as fibroid degeneration.

One of the most important effects, from a surgical point of view, of the acceptance of Guyon's theory, if carried to its logical conclusion, would be to prohibit the employment of any form of operative interference aimed at the radical cure of the disease—to limit the treatment, in fact, to the palliative kind.

Another theory is that propounded by Velpeau, and till recently supported by some of the highest authorities in this country and America, notably Thompson and White—viz.,

that enlargement of the prostate is analogous to fibroid disease of the uterus. In support of this view it is pointed out that the utricle of the prostate is the equivalent of the uterus (and vagina); that the structure of the prostate and uterus are somewhat similar; that there is a great resemblance in structure, position, and mode of growth between the fibro-myomata found in the uterus and the overgrowths that constitute enlarged prostate; and that the disease in both instances sets in when sexual activity is on the wane, and does not originate when that activity has completely ceased.

In opposition to this view are advanced the facts that the utricle, which is the true analogue of the uterus, takes no active part in the prostatic enlargement, and that the uterine tumours commence as fibro-myomata, whereas the prostatic overgrowths originate as adenomata.

The theory that enlargement of the prostate is of inflammatory origin dates back to the days of John Hunter, who advanced this view. Virchow also held the same opinion. Many papers have been published in the past few years advocating this theory. But its ablest champion is Ciechanowski, who explains the sequence of events as follows: 'A catarrhal process occurs in the acini, producing active proliferation, desquamation, and degeneration of the epithelium; at the same time a productive change takes place in the stroma, which compresses the excretory ducts of the acini, narrowing or obliterating them. The latter prevents the escape of the contents, the secretions accumulate within the acini, and the lobules enlarge. The prostatic urethra is said to be the origin of the disease, which extends thence along the gland ducts from the urethra towards the periphery of the prostate.'

The advocates of this theory hold that the disease is confined mainly to persons who have suffered from posterior urethritis previously, whether due to gonorrhœa, masturbation,

or sexual excess (whether natural or unphysiological). But they entirely fail to explain how it happens that the enlargement of the prostate does not occur during that period of life—viz., early manhood—when these diseases and conditions that are held to be the cause prevail, except that the process remains latent for years till even the existence of the provoking conditions has in many instances faded from the memory.

I have in many hundreds of cases of enlarged prostate inquired carefully into the previous history of each person, and my experience goes to show that the previous mode of life of the patient has nothing whatever to do with the advent of this disease. It occurs with equal frequency in those who have suffered from urethritis and those who have not; in the married and unmarried; in the continent and those who have indulged in sexual excess; in persons of sedentary as of active habits; in the gourmand as in him who has eaten sparingly all his life.

All we know of the disease is that the enlargement of the gland is mainly, if not wholly, of an adenomatous character, and that it occurs only during the decline of life when the sexual functions are on the wane. Having fulfilled its purpose as an accessory sexual organ in early and mature manhood, as its function diminishes the gland has a tendency in disease to 'run to seed,' as it were, in assuming this unhealthy adenomatous overgrowth; but why it does so has yet to be explained.

It is true, as will subsequently appear, that the usual symptoms of enlarged prostate may occasionally be induced in advanced life by an attack of inflammation, or even congestion, of the prostate; but in such cases there is practically no enlargement of the organ at all, and certainly no enlargement of an adenomatous nature as in true prostatic hypertrophy of declining life.

Symptoms.

We now come to the symptoms of enlarged prostate. A man aged over fifty years consults you because (1) he finds that for some time he has suffered from increased frequency of micturition which troubles him more at night than throughout the day; (2) he has some difficulty in starting the stream; (3) there is diminution in the strength of the urinary flow, which, instead of being projected in the normal curve, falls directly downwards from the meatus simply by its own weight; (4) he strains to propel the urine onwards, but his efforts have little or no effect in strengthening the stream; on the contrary, the straining may arrest the flow completely; (5) there is incomplete stoppage, as indicated by dribbling at the end of micturition; and (6) there may be intermittency of the flow due to the ball-valve action of the outgrowth in the bladder. If the patient does not complain of pain, beyond, perhaps, an undefined aching about the perineum, and there is no hæmaturia, the case is in all probability one of enlargement of the prostate in a comparatively early stage.

It will be observed that none of the symptoms are referable to the prostate itself. They are attributable to interference with the functions of the urethra and bladder caused by changes in the gland, which are so gradual that they do not cause pain like inflammation or malignant disease. As the disease progresses, unless relieved by art, all the symptoms are aggravated, and others, notably pain and hæmaturia, supervene.

In the early stages of the disorder the increased frequency of micturition is due to some outgrowth at the neck of the bladder, which acts as an irritant, like a foreign body, to this the most sensitive portion of the organ. Local congestion or even inflammation of the mucous membrane ensues, and this

induces further frequency. Later, another factor comes into play: a post-prostatic pouch is formed in which a gradually increasing quantity of urine is retained after micturition. This retained urine is, as we have already seen, termed 'residual,' and the manner in which it causes increased frequency requires some explanation.

The bladder is a reservoir capable of containing a certain quantity of fluid, which is voluntarily discharged at convenient intervals. Let us assume that the quantity passed in twenty-four hours is 50 ounces, and that the capacity of the bladder is 10 ounces. It will thus be necessary to empty the bladder at least five times in the twenty-four hours. But if, the actual capacity remaining the same, a pouch is formed in the bladder containing, say, 4 ounces of urine that is never expelled, it follows that the *effective* capacity is reduced to 6 ounces, so that in order to get rid of the 50 ounces that daily flow into it the bladder must be discharged of these 6 ounces about eight times. As the pouch enlarges and the bladder walls grow weaker the quantity of fluid permanently retained increases and its *effective* capacity diminishes, so that eventually micturition has to take place every half-hour or even less. Indeed, this condition may advance to such an extent that the bladder is incapable of discharging any urine whatever, when we have another symptom—viz., continuous dribbling—the urine passing away by day and night as rapidly as it enters the bladder, but the latter always remaining full. The urine passing in this condition is termed the 'overflow,' and has to be distinguished from 'incontinence,' a rare occurrence in certain spinal complaints in which the urine runs away from an empty bladder.

The frequency of micturition is, as already stated, worse at night, or, rather, towards the latter part of the night, and in the early morning on rising; in this respect contrasting with the frequency due to stone, which is always worse in the day-

time when the patient is going about. Why this should be so has not as yet been satisfactorily explained. It cannot be due to the recumbent position alone, for it does not occur in the daytime if the patient keeps lying down, provided he remains awake. It may, as has been suggested, be due to the fact that during the first sleep of the night the bladder is not relieved for a longer period than usual. Distension of the bladder results, with congestion, giving rise to increased frequency, which does not cease for some hours till the congestion has subsided.

The urine in the early stages of the disorder is clear and acid. The quantity will probably be increased and the specific gravity be lowered—changes due to fibroid degeneration of the kidneys met with in elderly persons, particularly when prostatic obstruction is also present. As the disease advances the urine becomes cloudy and gives off a fishy odour. Sooner or later the urine has a tendency to decompose, whether as a contingency of catheterism or otherwise, cystitis sets in, and pus is deposited on the bladder walls in thick flakes. This condition is favourable to the formation of phosphatic calculi, which are a frequent complication of enlarged prostate, lying in the post-prostatic pouch or in the cysts formed, as already described, by the bulging out of the mucous membrane between the muscular trabeculæ.

Diagnosis.

With the presence of symptoms that point to the probable existence of enlargement of the prostate we proceed to verify our diagnosis by a physical examination of the urethra and rectum.

The patient is first directed to pass all the urine he can, and we note the strength and general character of the stream. He is then placed on his back on a couch; the glans and foreskin are thoroughly washed with an antiseptic, and a

catheter, 13 or 14 of the French scale (7 or 8 E.), is slowly and carefully introduced. Our choice of catheters will lie between a Jaques' vulcanized rubber (Fig. 39), a very pliant cylindrical gum-elastic, or a French coudée (Fig. 40). This latter is, as a rule, the most easily introduced. It should be held almost horizontally at first, with the curved point turned downwards, and gradually elevated into the perpendicular position as the instrument passes onwards through the urethra and into the bladder. It should be noted if there be any obstruction at the neck of the bladder, and if the end of the catheter rides over it, which would probably indicate a



FIG. 39.

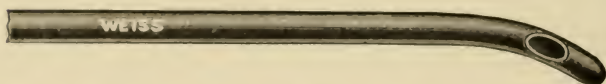


FIG. 40.

prostatic outgrowth in the bladder. The quantity of urine drawn off, if any, indicates the amount of 'residual' urine. This will vary from a few drachms to 3 or 4 pints, according to the stage the disease has reached when the patient first comes under examination. If the quantity be considerable he will express surprise, seeing that he had just previously passed urine, and was under the impression that he had emptied his bladder. If the quantity of urine be large, the whole of it should not be drawn off at the first interview, lest the patient may faint, or hæmorrhage set in from the vessels of the bladder giving way through loss of their habitual support. If the quantity be moderate, a second or third examination should be made to avoid error as to the real

amount of the 'residual' urine. Before introducing the catheter the hypogastric region should be palpated, for in this way it may at once be recognised that the bladder is distended with urine.

We next make a digital examination of the rectum. The forefinger is lubricated, the crevice beneath the nail having been previously filled with soap, and introduced slowly and gently to avoid giving pain, and a careful survey of the prostate is made. The extent of the enlargement, if any, should be noted, and whether this is general, or confined more to one side than the other; whether the contour of the gland is smooth or nodulated; what its consistency, whether soft, indicating adenomatous enlargement, or hard from inflammatory fibroid overgrowth; also if pressure on the gland gives pain, and, if so, to what degree. Much pain with fluctuation would suggest the probability of abscess, particularly if the patient has had fever recently. Intense hardness with nodulation would suggest malignant disease; and a very hard nodule in the substance of the gland, accompanied by tenderness on pressure, the presence of a calculus in the organ. The finger should pass beyond the gland if possible, and sweep the base of the bladder, to ascertain if this is normally soft, or hard from cancerous infiltration. Possibly a stone may be felt in the post-prostatic pouch. The examination will be facilitated by making counter-pressure on the abdomen above the pubes with the other hand.

The patient should next be placed on his knees on the couch, with his head bent forwards and downwards, and the buttocks rendered prominent by the thighs being flexed on the legs. The finger is again introduced and the rectum surveyed as before. This position renders the prostate more prominent in the rectum than the recumbent one, and the finger can be introduced farther. The impressions conveyed

to the finger in both positions are contrasted, and important information may thus be acquired.

Little information with reference to the condition of the amount of outgrowth in the bladder will be gained by rectal examination. In fact, there may be great outgrowth of the prostate into the cavity of the bladder when no enlargement of the gland is recognised by the rectum. It will, as a rule, be desirable to ascertain the extent and form of this enlargement. A rough estimate can be arrived at by the introduction of a short-beaked sound. When the instrument has entered the bladder, the handle is depressed between the thighs, and the beak rotated to one side and then to the other, feeling on which side of the instrument the enlargement lies, and to what extent it projects into the bladder. If the finger be introduced into the rectum whilst the sound is in the bladder, a rough idea of the size of the outgrowth may be formed.

Examination of the bladder by the cystoscope will in a large proportion of cases give a still more correct estimate of the size and shape of the outgrowth, and as to whether or not the gland is capable of being removed by operation in a manner that will be described later. At our first visit, however, it will not be advisable to employ either sound or cystoscope. This should always be deferred to a later interview, when the patient should be examined in his own room. At the first visit we rest content with the information gained by the catheter and by rectal examination, taken in connexion with the general symptoms.

After examination the patient should go home and to bed for the day. Indeed, when the case is at all far advanced and the patient feeble, it will be advisable to postpone the introduction of even a catheter till he is in his own room.

LECTURE VI

GENERAL TREATMENT OF ENLARGED PROSTATE AND ITS COMPLICATIONS

PASSING on to the treatment of enlargement of the prostate, you are aware that in this field of research considerable activity has been displayed by surgeons in recent years as regards operative interference. Holding, as I do, that in the vast majority of cases of this malady there is only one form of treatment worthy of consideration—viz., total enucleation of the diseased organ—the time has not yet come, and probably never will, when the employment of the catheter can be entirely dispensed with in practice. It is to its judicious use that I shall in large part direct your attention in this lecture, at the same time referring to other subjects connected with the general management of the disease under consideration.

When enlargement of the prostate is unattended by any symptoms no treatment is necessary. If, however, decided symptoms of obstruction are present, but the bladder contains no 'residual' urine, or only an ounce or two, the question arises as to what treatment, if any, is desirable. In such cases I am in the habit of passing a large steel dilator (Fig. 3) as far as the bladder once a week, and leaving it in position for ten or twelve minutes, commencing with a No. 11 or No. 12, English scale, and gradually advancing to No. 15 or No. 16. I entirely concur in the opinion of my

colleague, Mr. Reginald Harrison, as to the beneficial effect of this simple procedure. It probably does not stay the progress of the disease, but the periodical introduction of the dilator causes absorption of the gland around the urethra and maintains the patency of the channel, thus staving off for an indefinite period the necessity of having recourse to habitual catheterism.

It is customary in cases of this kind in the incipient stage of enlargement to administer ergot, with a view to causing reduction, or retarding the advance, of the outgrowth. I am in the habit of employing the liquid extract of this drug combined with a saline, both in hospital and private practice. It is difficult to say definitely whether the ergot has any effect in staying the advance of the enlargement, but it seems to relieve congestion, and patients undoubtedly express themselves as improved under its administration.

It will, as a rule, be unnecessary to have recourse to the habitual use of the catheter till the residual urine amounts to between 3 and 4 ounces; but if the frequency of micturition at night is such as to affect injuriously the patient's health through want of sleep, it will be desirable to commence earlier. When, however, about 4 ounces of residual urine have been reached habitual catheterism must be employed, and the patient enters on what is termed 'catheter life,' from which he can scarcely ever recede without an operation. When the 'residual' urine is limited to 4 ounces or less, it will, as a rule, be sufficient to pass the catheter once in the twenty-four hours, and the best time for doing this is at bedtime, so that he may have several hours of sleep afterwards. If 6 ounces are retained, the catheter should be employed twice daily; if 8 or 10 ounces, three or four times daily. When all power of voluntary micturition is lost, the catheter must be used whenever the desire for urination is decidedly felt, generally every four hours or so. On no account should the patient

be limited to any specific time within which he should not employ the catheter. The urine should be drawn off before pain or marked discomfort is felt; otherwise congestion of the prostate and bladder resulting in cystitis will be produced.

The patient must be taught how to use the catheter, and he should never be without one—that is to say, if he leaves home on a journey, or in the course of his ordinary occupation, he should always carry one about with him, for he may find at any time that its employment is imperative. Indeed, the sooner the patient recognises that the primary duty of his life, under such circumstances, is the employment of his catheter the better.

A soft coudée catheter (Fig. 40), Nos. 7 to 9 E., whichever passes most easily, is, as a rule, the best for habitual employment. The patient, unless very infirm, passes it standing. There is now no danger of syncope, for the quantity of urine allowed to accumulate is limited, and during the period of instruction in the use of the catheter that he will have undergone at the hands of the surgeon he will have acquired confidence in its use. The instrument is held perpendicularly whilst its end is introduced into the urethra. It is then gradually depressed into the horizontal position, as it glides along the canal over the obstruction and into the bladder, the curved end being directed upwards towards the roof of the urethra. Sometimes a well-polished vulcanized rubber catheter (Fig. 39) answers best. A timid patient likes it, as less liable to pain him; but if the prostatic urethra is narrowed from pressure of the lateral lobes it is not so easy to introduce as a more rigid instrument. It has also the disadvantage that, its walls being stout, the channel is comparatively narrow, so that the urine, if at all thick, will not flow through it readily. On the other hand, as it can be boiled without injury, it is readily rendered aseptic, and as it

coils up in a small space it can be carried about very easily. A soft and pliant cylindrical catheter will pass readily and answer best when there is no obstruction caused by the outgrowth in the bladder. When this outgrowth is very marked, a bicoudée catheter (Fig. 41), or a well-curved one terminating in a coude (Fig. 42), may be necessary to over-

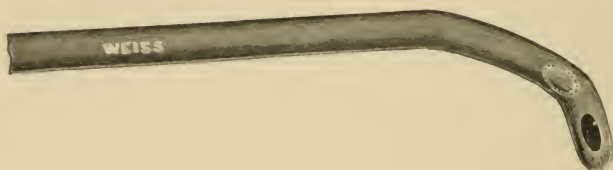


FIG. 41.

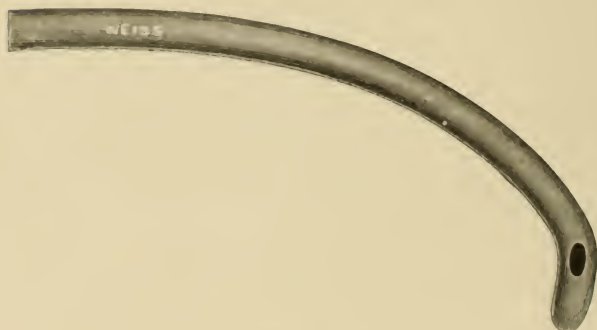


FIG. 42.

come the obstruction. Formerly it was customary to keep catheters mounted on a well-curved metal stylet ready for use; they are now woven with this curve in their manufacture and retain their shape permanently.

It will be rarely desirable for a patient himself to pass a metal catheter. When circumstances arise requiring its employment, the surgeon should be called in.

Whatever instrument is employed, it must be kept scrupu-

lously clean. The life and comfort of the patient depend not less on the cleanliness of his catheter than on the judicious use of the same. It will not be out of place, therefore, if I here direct your attention to the antiseptic precautions necessary in the employment of urethral instruments in general.

The instruments required for catheterism are of three kinds—metallic, soft rubber, and gum-elastic. The first two are most easily and effectually sterilized by boiling. They should be thoroughly washed and syringed through with soap and warm water, and then boiled for ten minutes, after which they are transferred to boric lotion ready for use. Gum-elastic instruments cannot be boiled without injury. They are best cleansed by washing and syringing them through with soap and warm water, and then placing them in a 1 in 40 solution of carbolic acid for ten minutes, after which they are placed in boric lotion before use. Prolonged application of strong antiseptics renders them rough and dangerous.

Before introducing an instrument of any kind into the bladder, the foreskin and glans should be well washed with soap and warm water, and then swabbed with some weak antiseptic lotion. If there be any discharge from the urethra, the anterior part of the canal should be syringed out with warm boric lotion, but otherwise this precaution is unnecessary. Bacteriologists tell us that even the healthy urethra swarms with organisms that cannot be completely got rid of by the most thorough irrigation by antiseptic lotions, so that, theoretically speaking, the introduction of an instrument into the bladder ought to be attended frequently by infection of the urine. Clinical experience, however, teaches us that with the simple precautions indicated this may be avoided.

It is useless to lay down an elaborate ritual of urinary

asepsis which cannot be followed out in practice by the patient himself. If we only reflect on the frequency with which a man who has entered on catheter life has to pass an instrument, and the circumstances under which he has often to do so, it is obvious that the means of keeping his catheter aseptic, to be efficient, must be as simple as possible. Fortunately in soap and water we have an efficient, convenient, and practical method of cleansing catheters, and this is what most patients have to rely on, and that with impunity. After using the catheter it should be again washed as before, thoroughly dried, and then placed for future use in a corked glass tube or covered dish. The best way of drying soft catheters is by pressing them between folds of lint or gauze, in which they may be kept till again required.

The powerful antiseptic properties of trioxymethylene, a white powder obtained by evaporation of formol, have recently been taken advantage of on the Continent for sterilizing gum-elastic catheters. This powder gives off slowly a vapour which is really formol in its gaseous form. If the catheters be placed quite dry on trays in an air-tight box (Fig. 43), with this powder enclosed between folds of lint, they are rendered quite aseptic in twenty-four hours by the vapour given off. Before use they should be placed in boric lotion, as the formol is slightly irritant to the mucous membrane of the urethra. The catheters can also be sterilized in a glass tube fitted with a cork (Fig. 44) containing the powder, which evaporates through a fine grating on its inner aspect.

As lubricants for instruments, fresh olive- or castor-oil or vaseline may be used. Carbolic acid should not be added; it irritates the mucous membrane if the proportion used be of any strength, and weak carbolized oil has practically no sterilizing effect. Guyon's pomade, composed of equal parts

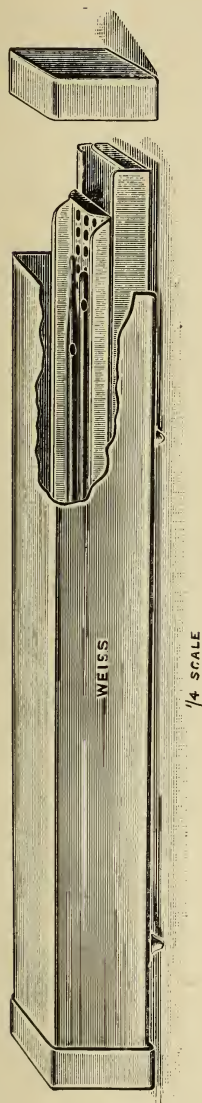


FIG. 43.—JANET'S CATHETER STERILIZER.

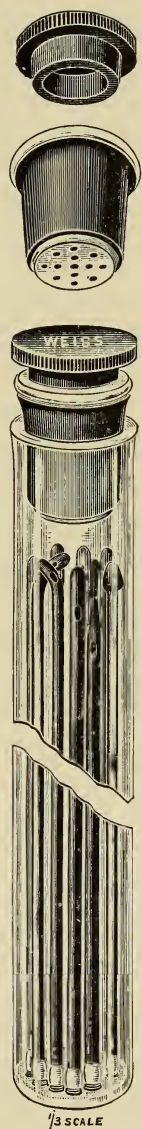


FIG. 44.—DENOS'S CATHETER STERILIZER.

of glycerine, powdered soap, and water with 1 per cent. of phenol or naphthol, is a clean and efficient lubricant.

The general, or hygienic, treatment is most important. The diet should be light, simple, and nutritious. Vegetables and fruit, particularly baked or stewed apples, should be taken regularly; but tomatoes, asparagus, and rhubarb should be avoided, as they act as irritants to the urinary tract. The less stimulants taken the better. The clothing must be adapted to avoid cold; the patient should be swathed in flannel. Sitting on cold or wet seats should be particularly avoided, to guard against congestion of the prostate. The daily warm bath, best taken at bedtime, promotes the action of the skin and relieves local congestion about the prostatic region. The most important part of the general treatment is the regulation of the bowels. If they become at all constipated the urinary symptoms are aggravated. Measures should, therefore, be taken to induce a soft, but not liquid, motion daily. There is nothing better than confection of sulphur or senna, or equal parts of both. Aloin, liquorice-powder, and the sulphate of soda are useful, or one of the natural bitter saline waters may be taken in the morning. The enema should always be at hand for use in case medicines should fail to induce a daily motion. If pain be present, an opiate must be given by the mouth, hypodermically, or as a suppository. On no account should belladonna be administered whilst the bladder retains any vestige of expulsive power, owing to its paralyzing influence on the muscles of that organ. Walking or carriage exercise should be taken daily, rough roads being avoided; but riding on horseback or on a bicycle should be abandoned on account of the shaking or direct pressure on the prostate caused thereby. The patient should as far as possible pursue his ordinary avocation and pleasures, but sexual excitement should be avoided.

Complications and Difficulties.

There are certain difficulties and complications incident to catheter life to which I will now direct your attention.

When the surgeon is consulted at a comparatively early stage of the disorder, before the residual urine amounts to more than a few ounces, if careful asepsis be employed in the introduction of instruments, the entry on catheter life is effected without any constitutional or local disturbance, and matters run smoothly.

If, however—and this is what happens in a large proportion of cases that come under observation—through wrong advice, or that timidity about consulting the surgeon that induces elderly men suffering from urinary troubles to put off what they regard as the evil day as long as possible, the symptoms have existed for a long time, there is difficulty and frequency of micturition with some pain, the urine is turbid, possibly fetid, the patient looks ill and worn-out, and the hypogastric dulness points to the presence of a considerable quantity of residual urine, the case must be regarded as one of considerable gravity. The employment of the catheter for the first time under these conditions is likely to be attended by constitutional disturbances, sometimes of severe character. The examination of such a case had better not be completed in the consulting-room—that is to say, you should defer drawing off the urine till the patient goes home. The examination should be completed in a warm room, so that the patient can go to bed immediately afterwards, where he should remain for two or three days in any case, and for a longer period should constitutional disturbances set in. To relieve the distended bladder and then allow the patient out in the cold is injudicious surgery. In hospital practice, when the catheter is employed in a case of this kind in the out-patient department, the man should be at once

admitted to bed. If the quantity of residual urine be large, only about half should be drawn off on first introducing the catheter. The quantity removed should be increased at each subsequent introduction, and the bladder not completely emptied for two or three days, during which the patient should be under close observation. If he be too infirm or nervous to pass the catheter himself, an experienced nurse should be employed for this purpose.

Urinary Fever in connexion with Catheterism.

In an advanced case of prostatic disease of this kind the urine, even when clear and acid on the first introduction of the catheter, generally becomes clouded, and eventually ammoniacal, in the course of a few days, and constitutional symptoms supervene. A rigor will probably occur, or even without this the temperature may rise to 103° or 104° F., profuse perspiration sets in, and, the normal temperature being reached, the fever may not recur. Sometimes more than one attack of this kind occurs, or the fever may be of a continuous character for some days, gradually subsiding; but occasionally the patient sinks into a low typhoid state, with dry, furred tongue, feeble pulse, and great thirst; and if the kidneys are much affected, uræmia, followed by coma, may set in, resulting in a fatal termination. This fever is variously termed 'urinary,' 'urethral,' and 'catheter,' but its exact cause—whether septic or neurotic—it is impossible with our present knowledge definitely to state. Certainly it occurs under the strictest antiseptic precautions and with the utmost skill in passing the catheter. The general treatment of this fever is similar to that following instrumentation or operation for stricture of the urethra, except that, owing to the advanced age and debility of the patient, it must be more sustaining, stimulants in moderation being

allowed. When the urine contains pus, the local treatment will be the same as that presently to be described for cystitis.

Cystitis.

This, as we have already seen, is a common complication of enlarged prostate, so that we must always be prepared to deal with it in its earliest stage. When the urine has a tendency to become cloudy, and gives off a fishy, offensive odour, a useful drug to administer is boric acid, which may



FIG. 45.

be given in 10-grain doses three times daily. A patient of mine, himself a medical man, who for years has been dependent on his catheter, informed me that he found two or three large doses of 25 grains each more effectual in bringing the urine back to its normal condition than repeated small doses; and I have since then frequently verified this experience in practice. If the urine becomes decidedly alkaline, the boric acid should be combined with the benzoate of ammonia in 10-grain doses. Urotropin in doses of from 5 to 10 grains three times daily is the most efficient drug for this condition. This is particularly effective when the urine contains pus and mucus.

When pus forms, the bladder must be washed out once or twice daily with disinfectants or astringent lotions. A 4-ounce indiarubber bottle fitted with nozzle and stopcock (Fig. 45) is the most convenient apparatus to employ for the purpose. It should be completely filled with the lotion, so as to avoid the introduction of air into the bladder. Not more than between 2 and 3 ounces should be thrown into the bladder at one time, though it may be necessary to repeat this process several times before the fluid returns

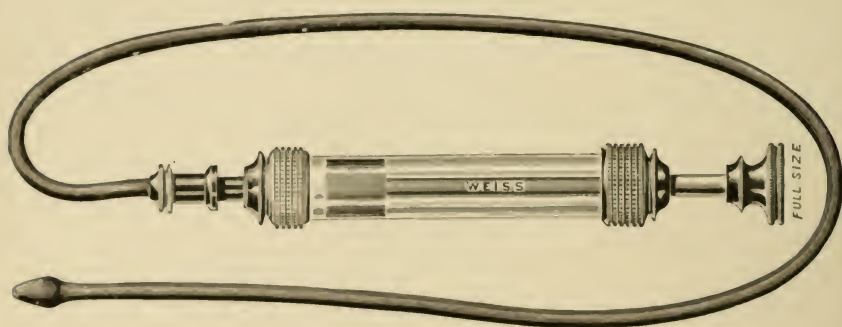


FIG. 46.

unaltered. If, however, the cystitis be severe, not more than $\frac{1}{2}$ ounce should be introduced, as the bladder walls are under such circumstances extremely intolerant of tension. All lotions should be used warmed to about 100° F. For cleansing the bladder the most simple and useful injections are a half-saturated solution of boric acid, or a teaspoonful of boro-glyceride to 4 ounces of water. Permanganate of potash solution, commencing with 1 in 5,000 and gradually increasing it to 1 in 1,000, and perchloride of mercury, 1 in 10,000, make excellent injections. But our sheet-anchor in such cases is nitrate of silver. Commence with a very weak solution, 1 in 4,000, gradually increasing the strength to 1 in 750. It is rarely that the bladder will tolerate a

stronger solution. I have found solution of resorcin, from 3 to 5 per cent., an excellent injection.

When there is great pain and scalding at the neck of the bladder from local cystitis, there is nothing to equal daily 'installations' of a strong solution of nitrate of silver. The urine is first drawn off and the bladder is washed out with boric lotion. The olivary tip of a Guyon's catheter-syringe (Fig. 46) is then passed just through the membranous portion of the urethra, and a drachm of the solution, gradually increased from 1 to 3 per cent., is slowly injected. This trickles back into the bladder and is allowed to remain there.

Complete Retention of Urine.

This is liable to occur suddenly at any time in connection with enlarged prostate, through congestion and swelling of that organ closing up the already narrowed passage. The congestion may be due to cold, sitting on a wet seat, errors in eating and drinking, sexual excesses, an attack of gout, or injury of the prostate by the catheter. Immediate relief of this retention is imperative—by means of the catheter if possible, otherwise by operative interference. It will be inadvisable to waste time by having recourse to hot baths and opium, as in the case of retention from stricture, for the patient being old and the muscular power of the bladder already impaired, any delay may culminate in complete and permanent atony of the bladder from overstretching of its muscles. To relieve the retention catheters of various kinds are employed. First, a vulcanized indiarubber catheter should be used. It is astonishing how retention may occur and still little or no resistance be offered to the entrance of a soft instrument of this kind. If this fail, a coudée catheter, and a well-curved one terminating in a coude, should be tried in succession. If still unsuccessful, a well-curved cylindrical

gum-catheter without a stylet should be employed. This instrument may be given any curve at pleasure by dipping it in hot water, bending it into the necessary shape, and then plunging it into cold water, when it retains its new form. If we fail with this, we employ the same catheter mounted on a stylet. As soon as the end of the instrument reaches the obstruction the stylet is partly withdrawn—a manœuvre which has the effect of causing the end of the catheter to project upwards and forwards, thus frequently entering the bladder. Finally, it may be necessary to employ an ordinary silver catheter, or one with a longer curve. The utmost gentleness should be used, force of any kind being avoided, lest a false passage be made, or hæmorrhage caused by injury to the prostate. When a median outgrowth is the cause of the obstruction, and the end of the metal catheter fails to ride over it, the point should be directed right or left with a view to hitting off the channel that exists on either side of its neck. If there be much difficulty in introducing a flexible catheter, it should be tied in for two or three days, but a metal instrument should, as a rule, be withdrawn. If we fail to introduce any kind of catheter, temporary relief may be given by suprapubic aspiration, after which in the course of a few hours a catheter may pass in readily; should this fail, it will be necessary to open the bladder suprapubically and drain it for a time.

If the retention occurs in an early stage of the enlargement, whilst the expulsive power of the bladder is still unimpaired, it is possible that after the use of the catheter for a few days the bladder may return to its normal state and habitual catheterism be unnecessary. But when the disease is far advanced, and the retention has existed for some time, it is rare for the bladder to retain its contractile power sufficiently to overcome the prostatic obstruction.

An attack of retention is almost invariably followed by

constitutional symptoms, so that the patient will have to remain in bed for several days, and the treatment generally will be the same as that already indicated when habitual catheterism is entered upon.

The Pre-prostatic Pouch.

In cases of enlarged prostate of long standing we may find that before the bladder is fairly entered a pre-prostatic pouch is encountered—that is, a pouch lying in front of the median outgrowth, and bounded on either side by the lateral lobes of the prostate, and which may permit the beak of a sound to rotate freely within it. I have not observed any reference to this pouch in the text-books, but its existence is of great importance. I have frequently known it to be mistaken for the true bladder cavity. Composed of the dilated prostatic urethra and that portion of the bladder cavity lying in front of this median outgrowth, it, as a rule, contains urine which is drawn off by the catheter, thus giving rise to the impression that the main cavity of the bladder has been entered. Recently I was called in consultation to see a case of this kind in which the medical attendant could only draw off about half an ounce of urine each time he introduced the catheter, but without relief to the patient, though the medical attendant felt sure that the bladder was entered. There was great distension of the bladder, felt above the pubes, which was attributed to blood-clot, as the patient was subject to periodic attacks of hæmorrhage. By means of a well-curved coudée catheter I was enabled to effect an entrance to the main cavity of the bladder and to draw off 3 pints of blood-stained urine, but in doing so I recognised a large pre-prostatic pouch from which the urine had previously been drawn.

A stone may form in this position. I have removed several such calculi, generally by litholapaxy, the cavity being suffi-

ciently large to permit me to work a child's lithotrite in it. I have also known calculi lying in the main cavity of the bladder missed through the surgeon mistaking this pouch for the bladder proper.

Hæmorrhage from the Prostate.

Hæmorrhage rarely occurs in the early stages of enlargement of the prostate, but when the disorder is well advanced this is always liable to take place from various causes. The bleeding may arise from the mucous membrane of the bladder or from the prostate. During the early days after entry on the habitual use of the catheter it is liable to occur from the former source, when there was much distension from residual urine previously, due to rupture of the vessels from their being deprived of their accustomed support. As a rule, the hæmorrhage is trifling, merely discolouring the urine, without the presence of clots, and requires no particular treatment, the symptoms gradually passing off. Then, there may be hæmorrhage as the result of congestion of the prostate after exercise or exposure to wet and cold. This is seldom severe, and also passes off with rest. In advanced stages of the disorder there is frequently a varicose condition of the veins on the surface of the prostate, and some hæmorrhage may occur from rupture of these. The bleeding may be so profuse as to distend the bladder. On many occasions I have had to open the bladder suprapubically to turn out an enormous clot filling its cavity. But the most frequent cause of hæmorrhage is injury of the prostate by careless or unskilful use of the catheter, or from difficulty in passing the instrument. As a rule, the blood is mixed with the urine; but if the injury be on the prostatic urethra, or on the anterior surface of an enlarged median outgrowth almost blocking the orifice, the blood may flow away quite pure from the urethra.

The treatment consists in perfect rest in bed and the

administration of opium. The usual styptic drugs are of little or no avail. The blood-clots may be allowed to dissolve and come away with the urine. Washing them out through a full-sized catheter with a large eye may be tried, but care should be taken that this does not induce further hæmorrhage. When, owing to difficulty in passing the catheter, bleeding occurs on each introduction, it is better to tie in a good-sized coudée catheter for a few days. If it gets clogged with clot, this may be displaced by gently injecting a little boric lotion from an indiarubber bottle.

Frequent hæmorrhage attended by much pain after exercise in prostatic patients should always give rise to the suspicion of the presence of stone. If a calculus lie in a saccule projecting out from the base of the bladder, there may be intense agony during defecation if constipation exist, and the urine will generally be blood-stained afterwards. I have met with two cases of this kind in practice—one in which the symptoms were completely relieved after the stone was removed suprapubically, and the cause of the other was discovered only after death.

Orchitis is common in connection with enlarged prostate, as a result of catheterism or independently of this; and excessive tenderness of one or both testicles is sometimes found, quite apart from any inflammatory state of the organs. Urethritis and balanitis may occur, particularly in patients suffering from diabetes.

LECTURE VII

THE AUTHOR'S OPERATION OF TOTAL ENUCLEATION OF THE ENLARGED PROSTATE IN ITS CAPSULE

IN November, 1900, I delivered a series of lectures in this College, in which I endeavoured to give a practical summary of our knowledge, as it then existed, of the disease generally known as 'hypertrophy of the prostate,' describing its pathology, symptoms, diagnosis, and various methods of treatment.

It was then pointed out that there is, perhaps, no other disease in the whole range of surgery for which so many and diverse modes of treatment have been advocated—a fact in itself suggestive of the unsatisfactory nature of most, if not all of them, so that at the time catheterism pure and simple, with all its disadvantages and dangers, reigned supreme in the practice of most surgeons as the least objectionable of all.

From time to time various procedures had been proposed and practised with a view to an attempt at radical cure of the disease, and a whole lecture was given up to a detailed description of the most important of them. [This lecture, which appeared in the first and second editions of my work, 'Enlargement of the Prostate,' is now omitted, as the surgical procedures referred to have since been practically abandoned, and are now merely of historical interest.]

Most prominent amongst them may be mentioned partial

prostatectomy (whether by the urethral, perineal, or suprapubic route), castration, vasectomy, and Bottini's operation, which consisted in an attempt to burn away by the electric cautery the so-called 'middle' lobe of the prostate.

Each of these procedures enjoyed a temporary though transient notoriety. I ventured to hold that partial prostatectomy by the suprapubic route, first performed by Belfield of America, but best known in this country in connection with the name of McGill, who brought it prominently before the profession in 1888, was the most practical attempt at a rational method of dealing with the obstruction caused by the enlarged prostate.

The operation consisted in opening the bladder suprapubically and removing the prominent portions of the prostate in that viscus, or as much of it as possible, by means of scissors, forceps, and scoops of kinds. I myself had performed this operation on several occasions with some measure of success. But apart from the high mortality attending the procedure it possessed the disadvantage that, though frequently followed by the subsidence of the most prominent symptoms, temporarily at least, and rendering the employment of the catheter more easy, in a very large proportion of cases the bladder failed to regain its power of expelling the urine. This was due to the fact that the outgrowth in the bladder is, as a rule, not the only or, indeed, the chief cause of the obstruction, as was imagined, which is mainly due to the lateral pressure on the urethra by the enlarged prostatic lobes. Indeed, when once the bladder had completely lost its expulsive power—that is to say, when the whole of the urine had to be drawn off by the catheter—McGill's operation was practically incapable of restoring that power. Add to this the fact that, as only the prominent portions of the prostate in the bladder were removed, there was no immunity against recurrent out-

growth or general enlargement of the gland, and we realize in what a very limited sense this operation could be regarded as radical. Owing to these considerations, the operation, after enjoying a temporary and fitful notoriety for a few years, may be said to have died out of surgical practice. It was replaced, first by castration and later by vasectomy, which was practised extensively during the closing years of last century. Experience has shown that both these procedures were practically useless, and that the former was not only attended by a very serious rate of mortality, but that it was frequently followed by grave disturbances of the mental balance. They no longer hold a place in practical surgery.

Shortly after these lectures were delivered, on December 1, 1900, I performed a new, and what seemed at first sight a very formidable, operation for radical cure of the disease—namely, total enucleation of the enlarged prostate. In a lecture delivered at the College in June, 1901, I gave full details of this and three further cases in which I had undertaken the operation, in all four, with complete success. Two of the patients were shown at the lecture in perfect health, able to retain and pass their urine as well as they ever did, though previously completely dependent on the catheter. The lecture was published in July, 1901,* and the operation was thus submitted for the consideration of the profession at large.

The complete success that followed these operations entirely revolutionized my views regarding the treatment of this widespread and painful malady, and opened up a new era in this branch of surgery. Since then I have from time to time published lectures and papers on several series of cases of my operation. In this manner full details of my first 432 cases have been placed before the profession.

* *British Medical Journal*, July 20, 1901.

Having now performed the operation in nearly 500 cases, I propose in this lecture to review its present position, giving the latest details of the procedure, and describing the anatomical and pathological considerations that render it practicable.

A careful examination of the specimens removed in these operations throws an entirely new light on the anatomy of the prostate and its relations to the surrounding structures, and shows that the descriptions contained in the anatomical text-books generally were incomplete and erroneous in treating that organ as a single body with a canal tunnelled through it in the form of the prostatic urethra.

The prostate is in reality composed of twin organs, of apparently purely sexual function, which, in some of the lower animals, remain distinct and separate throughout life, as they exist in the human male during the first four months of foetal existence. After that period, in the human foetus, they approach each other, and their inner aspects become agglutinated together, except along the course of the urethra, which they envelop in their embrace.

These two glandular organs, which constitute the lateral lobes of the prostate, though welded together, as it were, to form one mass, remain, so far as their secreting substance and functions are concerned, practically as distinct as the testes, their respective gland-ducts opening into the urethra on either side of the verumontanum.

Each of these two glandular bodies, or prostates, is enveloped by a strong, fibro-muscular capsule; and it is these capsules—less those portions of them that dip inwards, covering the opposing aspects of the glandular bodies or lobes, and thus disappearing from view, being embedded in the substance of the prostatic mass—that constitute the true capsule of the prostate regarded as a whole. This capsule extends over the entire organ except along the anterior and

posterior commissures or bridges of tissue that unite the lateral lobes in front of and behind the urethra, thus filling in the gaps between them. This true capsule is intimately connected with the prostatic mass, and incapable of being removed from it even by dissection.

The urethra, accompanied by its surrounding structures—viz., its longitudinal and circular coats of muscles continued downwards from the bladder, its vessels and nerves—passes downwards and forwards between, and is embraced by, the inner aspects of the two glands or lobes.

The ejaculatory ducts enter the prostatic mass close together in an interlobular depression at the posterior part of its upper aspect, each duct coursing along the inner surface of the corresponding lobe. They do not penetrate the capsules of the lobes, but pass forwards in the interlobular tissue to open into the urethra.

The prostate, thus constituted and enveloped by its *true capsule*, is further encased in a second capsule or *sheath*, formed mainly by the recto-vesical fascia, numerous connecting bands, however, passing between the two. The nomenclature here adopted is that suggested by the late Sir Henry Thompson in his work, 'The Diseases of the Prostate,' and is both scientific and practical. Embedded in the outer capsule, or sheath, lies the prostatic plexus of veins, most marked in front and on the sides of the prostate. This diagram (Fig. 47) shows the structure of the prostate and surrounding parts.

There is nothing that I can call to mind that illustrates more simply and forcibly the composition of the prostate and its coverings than an orange. If we imagine the edible portion of an orange composed of two segments only instead of several, with the septum between them placed vertically, we have a rough and homely illustration of the formation of the prostate. The strong fibrous tissue which covers the

segments of the orange, and which is intimately connected with the pulp, represents the *true capsule* of the prostate, the two segments or halves of the orange being represented by the two lobes. Further, the rind of the orange outside all represents the outer capsule or prostatic *sheath* formed by the recto-vesical fascia.

And here let me remark that in the operation that I shall presently set forth, it is this inner or true capsule as above

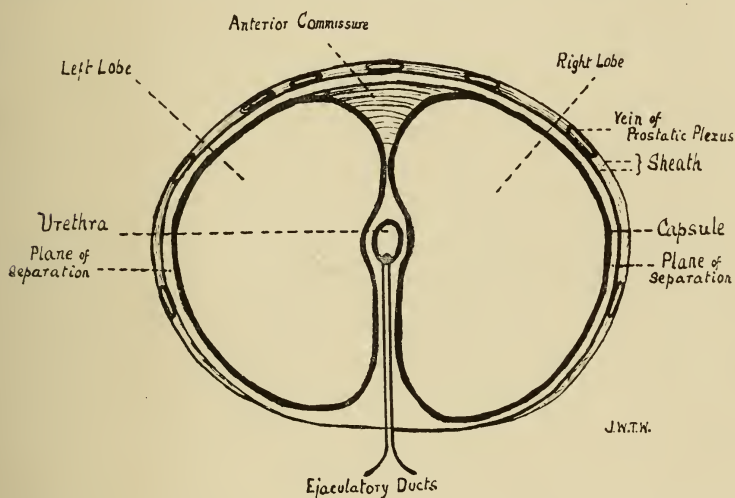


FIG. 47.—DIAGRAMMATIC VIEW OF CORONAL SECTION OF PROSTATE AND SURROUNDING SHEATH.

described that is removed, the outer capsule or sheath being left behind, thus preventing infiltration of urine into the cellular tissues of the pelvis. The text-books, as a rule, drew no distinction between the two separate coverings of the prostate, treating them both combined, or the outer one only, as 'the capsule.' To persons brought up in this school of thought and teaching my operation must at first sight necessarily have appeared impossible.

In most, if not in all, cases of enlargement of the prostate

of declining life (cancer being excluded) the overgrowth is adenomatous in character, numerous encapsuled adenomatous tumours being found embedded within the substance of the lobes, and frequently protruding on their surfaces. They sometimes assume the form of polypoid outgrowths (Fig. 38),

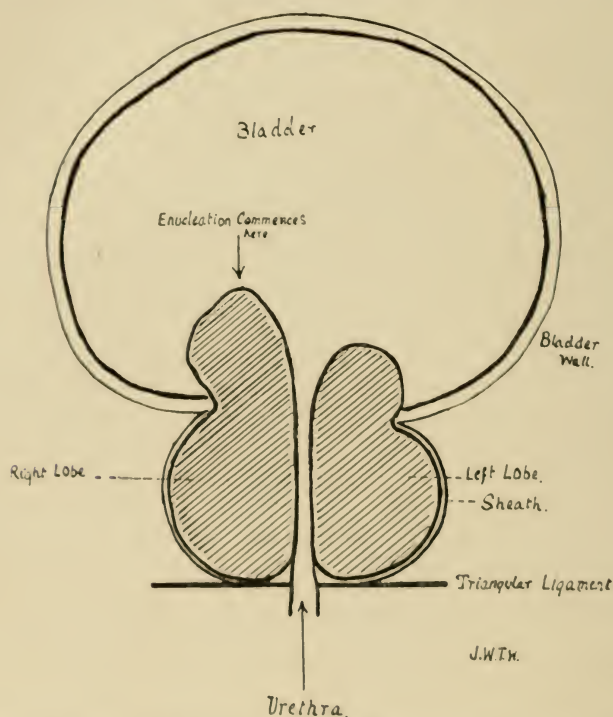


FIG. 48.—DIAGRAMMATIC VIEW OF HORIZONTAL SECTION OF ENLARGED PROSTATE AND BLADDER.

which, however, are invariably enclosed within the *true capsule*, which is pushed before them.

As the lobes enlarge they bulge out and have a tendency, each enclosed within its own capsule, to become more defined and isolated, thus recalling their separate existence in early fetal life. They become more loosely attached along their

commissures (particularly the anterior one), which in the normal prostate unite them in front of, and behind, the urethra. And in the course of this change the urethra, with its accompanying structures, is loosened from its close attachment to the inner surfaces of the lobes, particularly in front of the verumontanum, thus facilitating its being detached and left behind in the removal of the prostate, as will presently appear.

In the earlier stages of the adenomatous overgrowth the enlargement is probably entirely extravescical. Its expansion in this position is, however, limited, particularly by the triangular ligament below. As the enlargement progresses it advances in the direction of least resistance—namely, upwards into the bladder. The sheath at the superior aspect of the prostate is incomplete around the urethra. As the enlargement proceeds the prostate gradually insinuates itself through this opening in the sheath into the bladder (Fig. 48), and the inner layer of the muscle of the bladder becoming thinner and thinner from gradual pressure of the outgrowth, the prostate in this direction is eventually merely covered by mucous membrane.

In most of the specimens of enlarged prostate removed by me in this operation a well-defined circular groove is noticeable at the junction of the intra- and extra-vesical portions. This is caused by the constriction of the growth by the sharply defined edges of the sheath, which become sickle-shaped on either side as the prostate shoulders its way into the bladder, and by the sphincter muscle. The shape of the outgrowth of the prostate in the bladder appears to be mainly influenced by the conformation of the sheath superiorly, and, as pointed out by Mr. Thomson Walker, by the two strong, muscular bands found in the inner layer of the bladder muscle, which are continued downwards from the ureters, and, converging, pass into the floor of the urethra. Sometimes this outgrowth

assumes the form commonly known as a 'middle' lobe, which, as can be seen from the specimens, is not a middle lobe at all—there being no such structure in the normal prostate, as pointed out by Sir Henry Thompson more than forty years ago—but an outgrowth from one, or both, of the lateral lobes. More frequently, however, there is a protrusion of each lateral lobe into the bladder, and this may advance to such an extent that one half, or even more, of the enlarged prostate may lie in this viscus.

These, briefly, are the anatomical and pathological considerations on which my operation is based—a comprehension of which is necessary in order to follow me in my description of the details of the procedure. They are fully described in a very able paper recently communicated to the Royal Medical and Chirurgical Society by Mr. J. W. Thomson Walker.*

My ideal operation at the outset consisted in enucleating the enlarged prostate entire in its capsule out of the encasing sheath, leaving the urethra with its accompanying structures behind. But, as will subsequently appear, I discovered at an early stage in the history of the operation that the prostatic urethra might be torn, or even partially or entirely removed, with equally good eventual results.

The Operation.

Before performing the operation the bladder is thoroughly washed out with an antiseptic lotion, as in this disease the urine is almost invariably foul. The catheter employed for this purpose should be made of rather stiff gum-elastic, and be of the largest size that the urethra will readily admit.

Suprapubic cystotomy is now performed. After washing out the bladder the catheter is left *in situ*, and the viscus is distended with boracic lotion. The nozzle of the large

* *British Medical Journal*, July 2, 1904.

syringe employed for this purpose, and which is filled with lotion, is inserted in the end of the catheter, thus acting as a plug to prevent leakage from the bladder, and the syringe being ready to further distend the bladder with fluid, if necessary, as the operation proceeds. An incision, varying in length from $2\frac{1}{2}$ to $3\frac{1}{2}$ inches, according to the stoutness of the patient and the size of the prostate, is made in the median line of the abdomen, its lower end reaching to the level of the pubic arch. This incision is rapidly carried down through, or between, the recti muscles till the prevesical space is opened. Any bleeding vessels having been clamped by catch-forceps, the forefinger is introduced into the lower angle of the wound, and the prevesical fat scraped upwards off the bladder by the finger-nail for the whole length of the wound. The peritoneum, which should not be seen, is thus pushed upwards out of harm's way, and the bladder appears deeply in the wound, quite tense, glistening, and of a pale white colour, with large and tortuous veins coursing in its substance. Selecting an area devoid of veins, the point of the scalpel is plunged boldly into the bladder, and an incision about an inch long made in the vertical direction towards the symphysis. The wound in the bladder can be subsequently enlarged if necessary; and this is best effected—as being attended by least bleeding—by separating two fingers placed in the wound, and thus tearing the bladder wall to the required extent. On withdrawal of the scalpel the forefinger is introduced into the bladder as the lotion rushes out through the wound, and a general survey of the interior of the viscus is made. Should calculi be present they are at once removed by forceps or scoop.

The forefinger of the other hand is next introduced into the rectum to render the prostate prominent in the bladder, and to keep it steady during the manipulation by the finger in the bladder. The mucous membrane over the most

prominent portion of one lateral lobe (Fig. 48), or over the so-called 'middle' lobe, if there be but one prominence, is scored through by the sharpened finger-nail, and gradually detached by it from the prominent portion of the prostate in the bladder.

As I have already explained, this portion of the enlarged prostate is covered merely by mucous membrane, so that when this is scraped through and detached the true capsule of the prostate is at once reached.

Keeping the finger's point in close contact with the capsule, the enucleation of the prostate out of the enveloping sheath outside the bladder is proceeded with by insinuating the finger-tip in succession behind, outside, and in front of one lateral lobe, thus separating the capsule from the sheath. The finger is then swept in a circular fashion from without inwards, in front of and to the inner side of the lobe, detaching this from the urethra, which is felt covering the catheter, and pushed forwards towards the symphysis between the lateral lobes which will, as a rule, have separated along their anterior commissure in the course of the manipulations. The other lobe is attacked and treated in the same manner. The finger is next pushed well downwards behind the prostate and the inferior surface of the gland is peeled off the triangular ligament. When the prostate is felt free within its sheath and separated from the urethra, with the finger in the rectum, aided by that in the bladder, it is pushed into the bladder through the opening in the mucous membrane, which, during the manipulations, will have become considerably enlarged.

The prostate, which now lies free in the bladder, is withdrawn by strong forceps through the suprapubic wound. And here I may remark that it is astonishing through what a comparatively small suprapubic wound a very large prostate can be delivered, owing to the elasticity and compressibility

between the blades of the forceps of the adenomatous growth. Sometimes the lobes become detached along both anterior and posterior commissures and come away separately.

The question now arises, What becomes of the ejaculatory ducts in the course of this operation?

When the lobes come away separately they are probably left behind uninjured, attached to the urethra. When the prostate comes away as a whole, they may be torn across, or pulled out of the gland, a matter of trifling importance at an age when, as a rule, the reproductive powers are lost. But, as will subsequently appear, in the vast majority of my later operations, the distorted portion of the urethra behind the verumontanum has been removed with the prostate, the urethra being severed at the position at which the ejaculatory ducts enter it, the ducts as a rule remaining adherent to the portion of the prostatic urethra that is left behind.

Almost from the commencement I have abandoned the employment of any cutting instrument for incising the mucous membrane, finding the finger-nail alone most convenient and expeditious. Besides, when scissors or scalpel are employed there is danger of entering the capsule, and the guiding-line being thus lost, the finger flounders about inside, enucleating isolated adenomatous tumours instead of the whole organ in its capsule.

There is, as a rule, very little bleeding from the operation. It is astonishing the rapidity with which the cavity left by the removal of the prostate practically disappears, owing to the inherent elasticity of the sheath, the contractility of the surrounding muscles, and the pressure of the pelvic structures generally. The contraction that takes place somewhat resembles that of the womb in parturition, and no doubt has a similar influence in arresting hæmorrhage. The contractility of the cavity will be greatly facilitated by

pressing its opposing surfaces together by the points of the fingers in the bladder and rectum respectively. Irrigation of the bladder by hot lotion through the catheter and out by the suprapubic wound will also help to check bleeding and remove clots from the bladder. But I find that if continued for more than a minute or two it increases the bleeding instead of diminishing it.

A stout drainage-tube is introduced into the bladder through the suprapubic wound and retained there by a suture for four or five days; the abdominal wound is brought together by sutures, and the patient's abdomen swathed in absorbent dressings. But the toilet of the wound and the after-treatment are of such importance that a separate lecture will be devoted thereto. So I will conclude by giving details of a few illustrative cases, showing what may be accomplished by this operation. And in the first instance let me introduce the first two patients on whom I performed this operation some seven years ago. They have come at my request, so that you may interrogate and examine them yourselves, and bear testimony to the permanence of the cure. They are both, indeed, in excellent health, untroubled by any urinary symptom, and they will tell you that they regained their sexual power after having lost it temporarily before operation, through the pain and debility attendant on the malady.

ILLUSTRATIVE CASES.

CASE I.—J. T.—, aged seventy-one, admitted to St. Peter's Hospital, November 21, 1900, with prostatic symptoms of several years' standing. Double vasectomy had been performed by me in January, 1900, but with no amelioration of the symptoms. Catheter employed for one year; entirely dependent thereon, nine months; prostate, *per rectum*, much enlarged, bilobed, smooth, soft, movable. Cystoscopic examination on November 28 revealed a bilateral prominence of the prostate in the bladder. Total enucleation of the prostate was performed by me December 1, 1900, in the manner just described, the lobes coming away

separately and the urethra being left behind. Considerable bleeding at first, but this was quickly arrested by irrigation with hot hazeline solution. No vessels were ligatured. On December 13 patient passed 12 ounces of urine *per urethram*, and subsequently none passed by the wound, which had completely healed by December 21. The prostate weighed $2\frac{1}{4}$ ounces. This patient, as you see, now aged seventy-eight, seven years after operation, is in perfect health, able to pass and retain his urine, which is normal, as well as he ever did.

CASE 2.—Gentleman, aged sixty-seven, consulted me for prostatic symptoms of five years' duration. Catheter employed for three and a half years; entirely dependent thereon, six months. Urine thick with pus and very offensive.

On March 30, 1901, I enucleated the prostate, the lobes, as in the previous case, coming away separately, and the urethra being left behind. Recovery was uninterrupted and complete. Left the surgical home May 2; able to pass and retain his urine normally. He is now, as you see, nearly seven years after operation, in excellent health, and he will tell you that he can retain and pass his urine naturally as well as he ever did. He will further tell you that his sexual power, which was completely lost for two years before operation, was regained, and that he has had emissions of semen, showing that the ejaculatory ducts were unharmed in the operation. The prostate weighed $2\frac{3}{4}$ ounces.

CASE 4.—Gentleman, aged sixty-two, sent by Dr. W. Douglas, Newbury. Prostatic symptoms, one year; catheter employed, six months, but patient passed some urine naturally; acute cystitis, with great frequency of micturition—half-hourly by day and night; much pain and frequent stoppage of urine; residual urine, 8 ounces, contained much pus; prostate greatly enlarged *per rectum*, bilobed, soft, movable. Cystoscopic examination revealed bilateral prominence of the prostate in the bladder with a pedunculated outgrowth, which acted as a ball-valve to the urethra.

On June 7, 1901, Mr. H. Frankling assisting, I enucleated the prostate (Fig. 49) entire in its capsule, leaving the urethra behind. Patient passed several ounces of urine *per urethram*, June 12, and on June 16 the wound was closed. Before leaving the surgical home he was seen by Dr. J. Farquharson, M.P., and others, in good health, able to pass and retain his urine normally. I have seen him on several occasions since then in perfect health, and pursuing his ordinary avocation with vigour. On January 5, 1908, six and a half years after operation, he writes: 'From the day I left the home up to the present time I have never suffered the slightest pain or inconvenience in any way, and I feel now ten years younger than when I first, so fortunately for me, met you.' The prostate (Fig. 49), which weighed $2\frac{1}{4}$ ounces, presents a well-marked pedunculated outgrowth in the bladder.



FIG. 49.—PROSTATE, WEIGHING $2\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-TWO (CASE 4). ACTUAL SIZE.

Shows pedunculated outgrowth in bladder. The groove A, B indicates position in which urethra lay.



FIG. 50.—PROSTATE, WEIGHING $2\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED FIFTY-EIGHT (CASE 9). ACTUAL SIZE.

Catheter lies in position occupied by urethra.

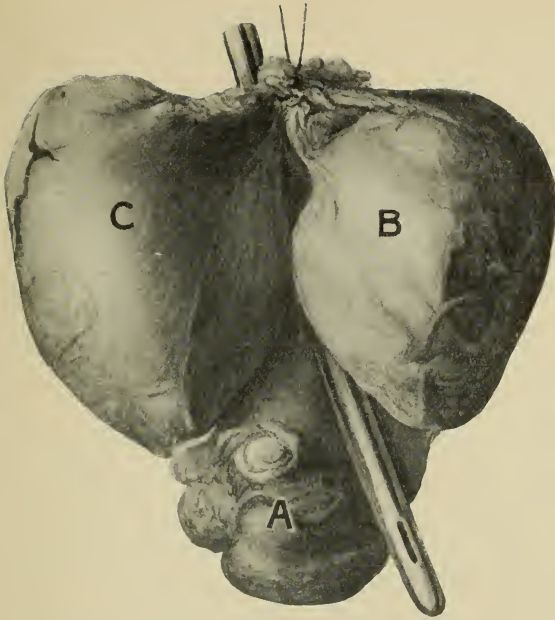


FIG. 51.—PROSTATE, WEIGHING $3\frac{1}{2}$ OUNCES, FROM PATIENT AGED SEVENTY-SIX (CASE 12). EXACT SIZE.

B, C, Lateral lobes ; A, 'middle lobe' growing from C.

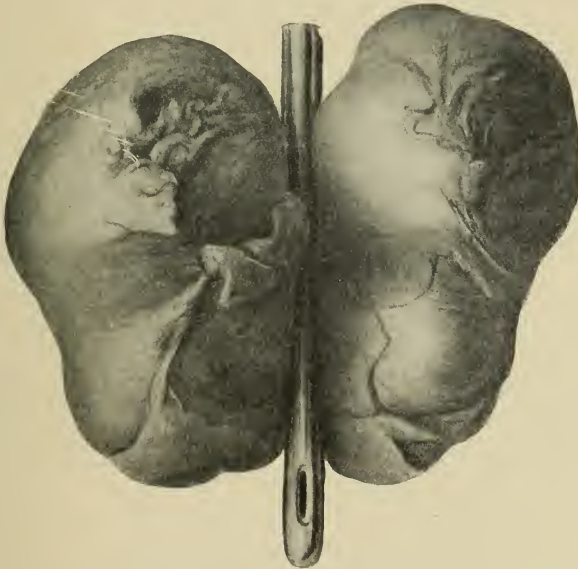


FIG. 52.—PROSTATE, WEIGHING $2\frac{1}{2}$ OUNCES, FROM PATIENT AGED SIXTY-EIGHT (CASE 13). ACTUAL SIZE.

CASE 15.—Distinguished public man, formerly governor of a province in India, aged seventy-nine, seen in consultation with Dr. Scott, Camberley, June 10, 1902. Prostatic symptoms had existed three years; completely dependent on catheter for nine months; catheterism painful and accompanied by hæmorrhage at times, also orchitis. Prostate much enlarged *per rectum*—particularly on the left—bilobed, rather dense, but movable.

On June, 23, Dr. Scott assisting, I examined the patient cystoscopically,

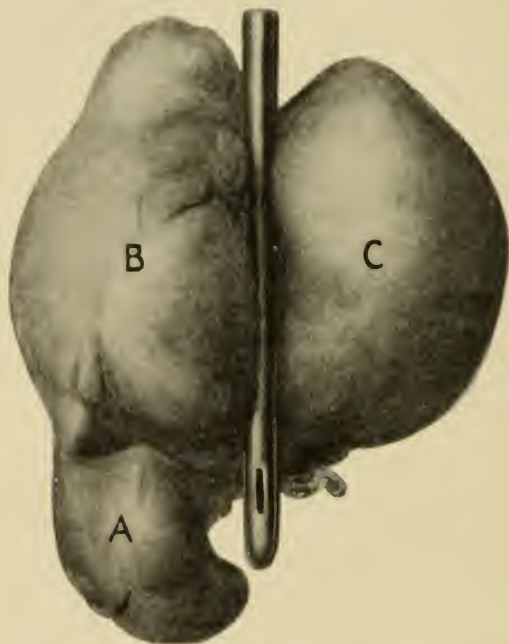


FIG. 53.—PROSTATE, WEIGHING 2 OUNCES, REMOVED FROM PATIENT AGED SEVENTY-NINE (CASE 15). ACTUAL SIZE.

C, Right lobe; B, left lobe, continued into the bladder in the form of a so-called 'middle' lobe, A. The catheter shows the position occupied by the urethra.

and saw a valvular outgrowth from the left lobe, the size of a gooseberry. I forthwith enucleated the prostate, the lobes coming away separately, and the urethra being left behind. Ten minutes elapsed from commencing the suprapubic incision till the prostate was delivered from the bladder.

The patient bore the operation well, but was so sick from the anæsthetic that for three days he had to be fed entirely by the rectum. On June 29,

the temperature rose to 103° F., and the right parotid gland suddenly swelled to a large size, and on July 2 there was swelling of the right testicle. Both glands subsided without suppuration. What the cause of the swelling of the parotid was—whether due to chill, the result of rectal feeding, or occurring, as it occasionally does, after operations on the pelvic viscera and abdomen—I am unable to say. I feared at first that it might be due to septicæmia, but this was obviously not the case. Urine began to pass naturally on July 16, and the abdominal wound was completely closed on the 27th. I saw this patient more than four years after the operation. He was in excellent health, had put on much flesh, and assured me that he passed and retained his urine better than at any period of his life previously to operation.

The prostate (Fig. 53) weighed 2 ounces, with each lobe enveloped in its true capsule. It is adenomatous, but rather hard. It will be observed that the so-called 'middle lobe' (A) is merely an outgrowth from the left lobe (B).

CASE 21.—This gentleman, aged sixty-five, on the advice of Dr. Goldie of Auckland, came to me from New Zealand for the purpose of having his prostate removed. Prostatic symptoms for three years; complete retention of urine eighteen months ago relieved by catheter, which has been employed ever since, practically all the urine passing in this way. Has used narcotics to relieve the pain. Prostate enormously enlarged by rectum, round, smooth, soft, elastic, movable above rectum. Cystoscopy on July 16, 1902, failed owing to bleeding.

On July 23, Mr. W. Braine being anæsthetist, I opened the bladder suprapubically, and enucleated the prostate entire in its capsule, the lobes separating along their anterior commissure, and the urethra being left behind. The whole operation lasted twenty-two minutes, the enucleation of the prostate and its removal from the bladder occupying only six minutes. There was not much bleeding, but an hour and a half after operation there was great shock and collapse, from which the patient soon rallied. Recovery uninterrupted and rapid. Urine began to pass by the urethra July 31, and the whole of it in this way after August 6, when the suprapubic wound was completely closed. On February 8, 1906, he wrote from Auckland: 'I am in the best of health, and have had no urinary trouble or pain since the operation, three and a half years ago. In fact, I feel as well as I ever did in my life; can hold or pass water at will like a man of twenty-one, although I am in my sixty-ninth year.'

The prostate (Fig. 54) weighs $4\frac{1}{4}$ ounces, is non-symmetrically enlarged, the left lobe being much larger than the right, with a 'middle' lobe behind the urethral orifice, formed by an outgrowth from the left lobe.

CASE 23.—Captain J —, aged seventy-two, came from Wales to consult me October 24, 1902, on the advice of Dr. A. Rees, of Cardiff, and Dr. Ironside, of Hampstead. Prostatic symptoms for nine years ; retention of urine six years ago ; much pain and hæmaturia for four years ; catheter regularly employed for three years.

I drew off 6 ounces of turbid urine containing some pus and mucus. Sounded, but no stone found. Prostate enormously enlarged *per rectum*,

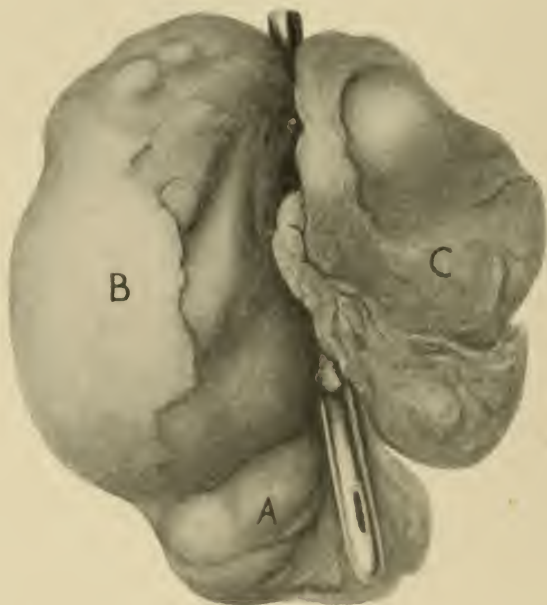


FIG. 54.—PROSTATE, WEIGHING $4\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-FIVE (CASE 21). ACTUAL SIZE.

A, 'Middle' lobe, growing from left lobe, B, which is much more enlarged than right lobe, C.

bilobed, smooth, soft, elastic, movable ; suffering from chronic bronchial catarrh. Pulse irregular and bounding ; high tension. Patient very stout.

On October 17, Mr. C. Braine giving chloroform, Colonel Lucas, C.B., and Major Freyer, C.M.G., being present, I opened the bladder suprapubically. Prostate found much enlarged into bladder, particularly the left lobe, which projected like the handle of a pistol, forming a so-called 'middle' lobe. The prostate was enucleated easily and rapidly, the

lobes separating along both commissures and coming away separately, leaving the urethra behind uninjured. There was very little bleeding, and the operation was completed in twenty-four minutes.

The recovery was uneventful. Some urine passed naturally on October 20, and the whole of it in this way on and after November 8. On November 27 he went home to Wales in excellent health, untroubled by any urinary symptoms. On December 1 he wrote: 'I am feeling

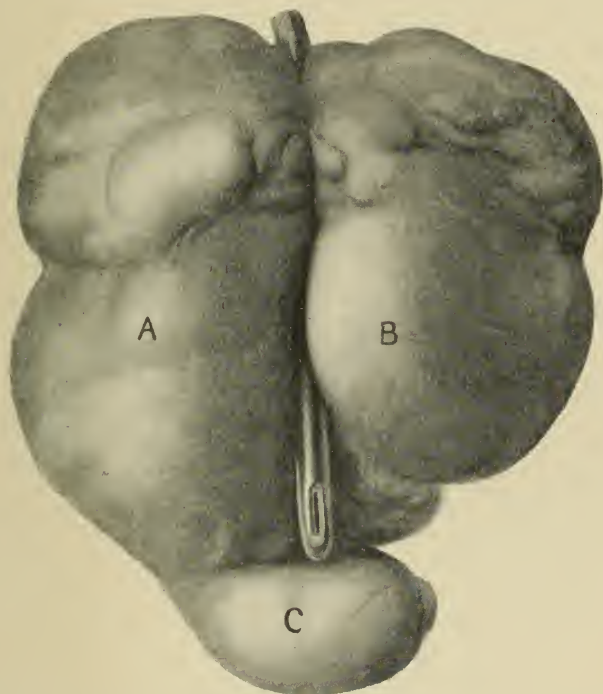


FIG. 55.—PROSTATE, WEIGHING $6\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED SEVENTY-TWO (CASE 23). ACTUAL SIZE.

C, Pistol-shaped continuation of left lobe, A, forming so-called 'middle lobe,' which obstructed entrance of catheter; B, right lobe.

splendid. I now make water freely, and have thorough control of it.' On November 27, 1904, he wrote: 'This being the anniversary of my leaving your care two years ago, I cannot let it pass without thanking you for the splendid work you did on me.'

Fig. 55 is the prostate, weighing $6\frac{1}{2}$ ounces. The left lobe (A) was continued into the bladder, forming a projection like the handle of a

pistol—the so-called ‘middle’ lobe—and obstructed the entrance of the catheter.

CASE 24.—J. H—, aged sixty-six, sent by Dr. William Curtis, Alton, Hants, August 5, 1902. Prostatic symptoms for thirty years. Retention twenty-four years ago; urine drawn off by Dr. Curtis. Since then no urine passed except by catheter. During last two years in great agony from usual symptoms of stone, superadded to those of enlarged prostate. Has had numerous attacks of cystitis with fever. Catheter now required every half to one hour. Inguinal hernia requiring a truss. Patient extremely feeble, anæmic, and much depressed. I drew off 3 ounces of stinking urine containing blood, pus, and mucus. Sounded, and multiple calculi detected. Prostate enormously enlarged *per rectum* bilaterally, soft, elastic, movable, placed high up, so that the finger cannot reach beyond it.

Litholapaxy in September, debris of calculi weighing 180 grains. Thirteen days under treatment, when he left for home to recruit his health preliminary to undergoing operation for removal of prostate.

Returned on November 4. Bladder washed out twice daily to improve its condition. On November 12, 1902, I removed the prostate, both lobes of which were unusually prominent in the bladder. The lobes separated along both commissures and came away separately, leaving the urethra behind. There was considerable hæmorrhage and shock, and for several days patient suffered much from nausea. The wound was slow in healing, no urine passing naturally till December 15. On December 28 the suprapubic wound had closed, and on January 6 he went home quite well, passing and retaining his urine naturally. On January 8 Dr. Curtis wrote: ‘I am perfectly delighted with the result. It is a triumph of surgery.’ On December 27, 1905, more than three years after operation, the patient writes: ‘I am thankful to be able to say I have none of my old troubles since the operation. I am in fairly good health, and free from all the old agonizing pain.’ On January 6, 1908, his daughter writes similarly.

Fig. 56 is the prostate, weighing 6½ ounces, the lobes (A, B) being placed in apposition as before removal. On the prominent portions in the bladder (at C, C’) are ulcers, no doubt caused by the calculi previously removed by litholapaxy.

CASE 25.—Captain E—, aged sixty-eight years, came from Argyllshire to consult me November 17, 1902, on the advice of Mr. G. Henderson, of Kilm. There had been prostatic symptoms for nine years, and the urine had been drawn off by catheter entirely for six years. During the last three years there had been frequent attacks of cystitis and hæmorrhage, blocking the catheter, which had to be passed every hour day and night. The pain had been excruciating, requiring morphine to subdue it, and the urine was thick with pus and mucus. ‘Is now in such a state,’

wrote Mr. Henderson, 'that he would submit to anything rather than go on suffering as at present.' I drew off a couple of ounces of urine thick with pus, mucus, and blood, and of a fearful stench, and with the soft catheter detected calculi in the bladder. Upon sounding it was found that many calculi were present. The prostate was enormously enlarged

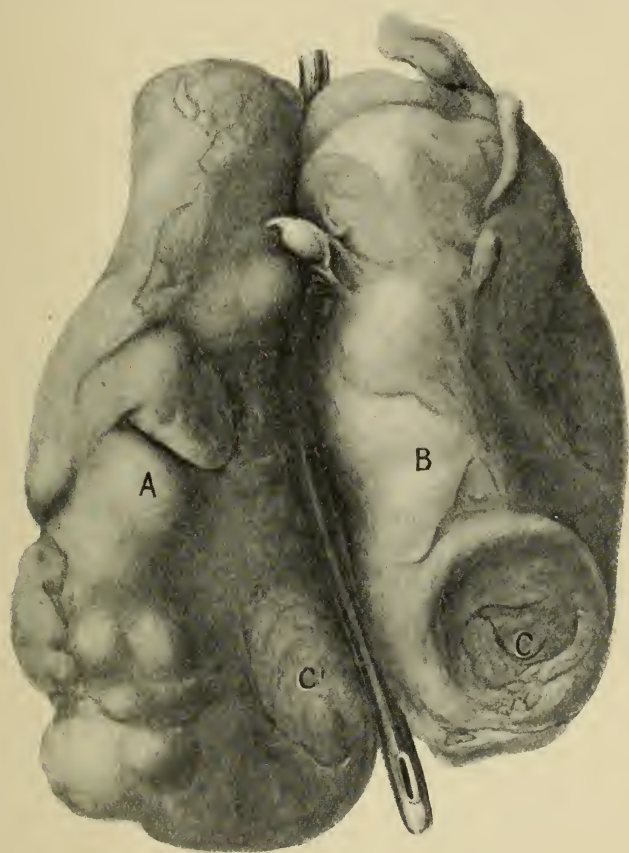


FIG. 56.—PROSTATE, WEIGHING $6\frac{3}{4}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-SIX (CASE 24).

A, B, Lateral lobes ; C, C', ulcers on prominent portions in bladder caused by calculi.

per rectum, bilobed, rather hard, nodulated, but movable. The patient was emaciated, but wiry.

On November 29, assisted by Mr. D. S. Wylie, Major S. F. Freyer

and Major C. W. Johnson being present, I opened the bladder suprapubically and found it full of calculi, varying in size from a hazel-nut downwards, each faceted and all composed of phosphates. These I



FIG. 57.—JAR CONTAINING NINETY-SIX ENTIRE CALCULI AND DÉBRIS OF OTHERS, WEIGHING $5\frac{1}{4}$ OUNCES, REMOVED FROM THE BLADDER OF CASE 25.

extracted by forceps and scoop, the process being a lengthy one, occupying thirty-five minutes. There were ninety-six calculi counted, besides the débris of many more, weighing $5\frac{1}{4}$ ounces (Fig. 57). The

prostate was then enucleated as a whole in its capsule, the lateral lobes separating along their anterior commissure, and the urethra being left behind. The prostate was so large that it had to be divided into its two lobes by the finger to facilitate its removal. The enucleation and removal occupied five minutes. Though there was free bleeding during the removal of the calculi, there was practically none during the removal of the prostate. Convalescence was established without any rise of tem-

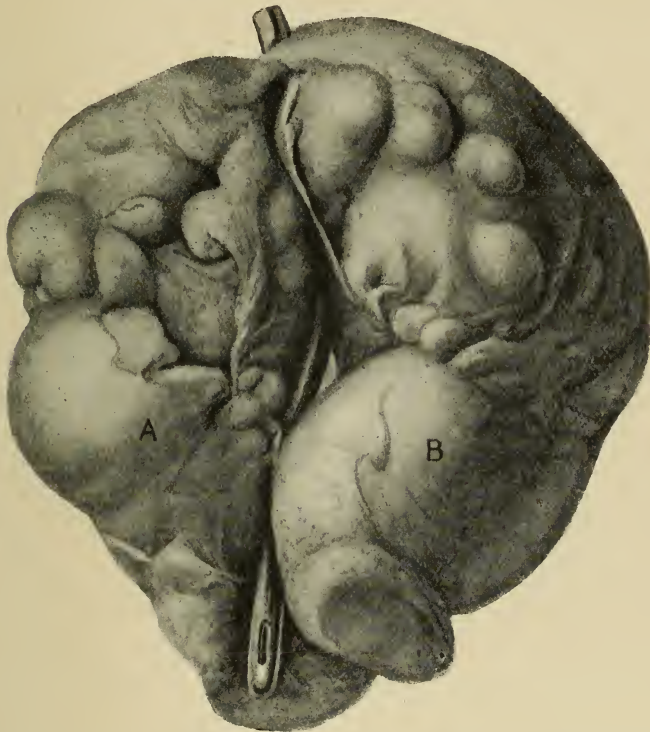


FIG. 58.—PROSTATE, WEIGHING $6\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-EIGHT (CASE 25). ACTUAL SIZE.

B, Right lobe ; A, left lobe. The vesical end of B shows an ulcer caused by the calculi. The catheter shows the tortuous course of the urethra.

perature or other unfavourable symptom. Some urine passed naturally on December 6, and the whole of it thus on and after December 12. On December 30 the patient travelled home to Argyllshire in perfect health, having put on much flesh, and being able to pass and retain his urine

naturally. On July 2, 1904, he wrote: 'I am glad to say that I am A1—50 pounds heavier than when you first saw me, November 15, 1902. My everlasting gratitude to you.' And on January 6, 1908: 'The urinary organs are in excellent condition. I sleep six and seven hours on a stretch without inconvenience. Since the day you relieved me I have never had an ache or pain of any sort whatever.'

The prostate (Fig. 58) weighs $6\frac{1}{2}$ ounces. The catheter shows the



FIG. 59.—PROSTATE, WEIGHING $5\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED SEVENTY-ONE (CASE 37).

The constriction at A, A' is the boundary between the intravesical and extravescical portions of the gland.

tortuous shape of the urethra. The end of the right lobe (B) projecting into the bladder is ulcerated, the result of the calculi.

CASE 37.—Gentleman, aged seventy-one, consulted me March 16, 1903, on the advice of Dr. J. F. Tuohy, of Hove. Five years previously had hæmaturia for two days after a game of tennis. Consulted two London surgeons, one of whom sounded him and washed out his bladder in a home for several days. Scalding and increased frequency of

micturition ever since. Three weeks previously hæmorrhage set in again, when he saw Dr. Tuohy, who found he had a large quantity of residual urine, the result of a very much enlarged prostate, and advised him to have the prostate removed. Catheter employed twice daily. I drew off 8 ounces of residual urine, which was turbid from muco-pus. Prostate greatly enlarged *per rectum*, markedly bilobed, soft, tense, smooth, movable; felt bimanually like a large orange.

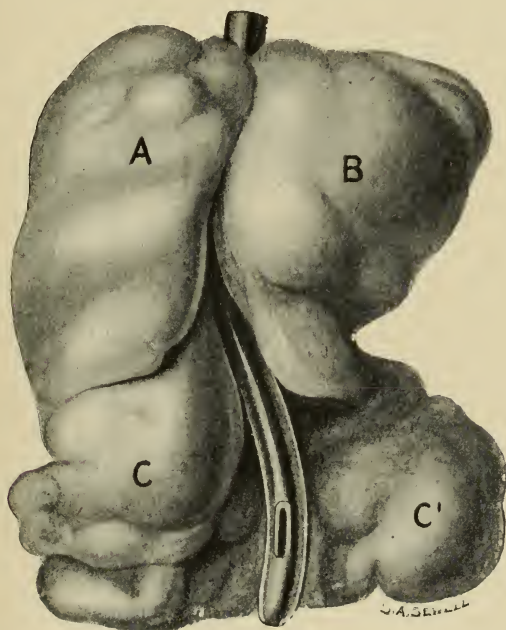


FIG. 60.—PROSTATE, WEIGHING $3\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED SEVENTY-THREE (CASE 136).

B, Right lobe; A, left lobe, terminating in fan-shaped outgrowth, C, C'.

On March 18, Dr. Tuohy assisting, I removed the prostate entire in its capsule, the urethra being left behind. Both lobes were very prominent in the bladder—almost pedunculated outgrowths. The enucleation was easy and rapid, only ten minutes elapsing from commencing the suprapubic incision till the prostate was delivered from the bladder. Scarcely any bleeding or shock. The patient made an uninterrupted recovery, the temperature remaining practically normal throughout. Urine began to pass naturally April 14, and the wound was quite closed April 19. Went home to Brighton April 23 in good health, able to retain and pass

his urine as well as he ever did. I have met this gentleman frequently since then in perfect health. On January 7, 1908, more than four years and nine months after operation, he writes: 'I could not have been doing better. The operation was a complete success.'

The prostate (Fig. 59) is a fine specimen of the symmetrically enlarged type, weighing $5\frac{1}{2}$ ounces.

CASE 136.—Member of the medical profession, aged seventy-three, consulted me October 4, 1904. Symptoms of enlarged prostate seven years; entirely dependent on catheter five years. Urine clear, acid, specific gravity 1020, trace of albumin. Prostate greatly enlarged, bilobed, soft, movable, felt very prominent in bladder bimanually. Mitral disease of heart, with loud bruit. Seen by Sir Thomas Barlow and Dr. de Havilland Hall, both of whom considered that the state of the heart did not contraindicate the employment of an anæsthetic, provided he had a week's rest in bed with careful dieting.

On October 25, Dr. Hewett being anæsthetist and Mr. H. W. Carson being present, I enucleated the prostate (weighing $3\frac{1}{4}$ ounces), the lobes of which were very prominent in the bladder, particularly the left (Fig. 60, A), which spread out in the form of a fan (C, C'). In the enucleation a small portion of the left lobe was broken off owing to inflammatory adhesions to the bladder, and was removed separately. Time, six minutes; scarcely any bleeding and no shock—in fact, the pulse was better after the operation than before.

Recovered without any unfavourable symptom. Urine passed naturally November 9; wound dry November 14. Left the surgical home quite well November 26; able to retain and pass urine as well as ever. He is now in active pursuit of his profession. On January 5, 1908, three years after operation, he writes: 'So far as urinary troubles are concerned, I have kept perfectly right since leaving the home. Micturition is more free than it has been probably since childhood.'

LECTURE VIII

I.—DEVELOPMENTS OF THE AUTHOR'S OPERATION INVOLVING PARTIAL OR TOTAL REMOVAL OF THE PROSTATIC URETHRA

WHEN I first conceived the possibility of removing the whole prostate, my ideal operation consisted, as already stated, in enucleating the enlarged gland entire in its capsule out of the enveloping sheath, leaving the urethra behind; and this was the procedure undertaken in my earlier cases. An accident which occurred during the operation on my eighth case had, however, the effect of materially modifying my views in this respect. In a lecture delivered on January 15, 1902, on my second series of four cases of the operation, and published in the *British Medical Journal* of February 1 of the same year, I introduced the description of this case in the following words: 'I now pass on to the eighth case, which presents some peculiarities, not the least interesting being that, though in the removal of the prostate as a whole the urethra was undesignedly torn across at its junction with the bladder, no untoward result ensued, the patient making a thorough recovery.' The details of the case are these:

CASE 8.—This patient, aged sixty-five years, had a history of prostatic symptoms for ten years, much aggravated during the last two and a half years, particularly as the introduction of the catheter caused hæmorrhage. The prostate was felt to be greatly enlarged *per rectum*, tense, elastic, smooth, globular, and quite movable. Cystoscopic examination revealed an irregular bulging into the bladder all round its neck.

On December 11, 1901, I operated. After enucleating the prostate in its capsule from the sheath all round, I felt the catheter passing through its axis (the urethra), and that the lobes had not separated either along the anterior or posterior commissure. Passing my finger along the anterior commissure, counter-pressure being made by the finger in the rectum, I endeavoured to separate the lobes, when suddenly the whole mass was propelled into the bladder. The urethra was then felt covering



FIG. 61.—PEAR-SHAPED PROSTATE, WEIGHING 3 OUNCES, REMOVED FROM PATIENT AGED SIXTY-FIVE (CASE 8).

the catheter, but severed at its vesical end. On examination of the prostate after removal I found that it was pear-shaped, and that it had been drawn from the urethra, which was severed at the neck of the bladder, just as a bead is drawn from a string. There were more hemorrhage and shock than in the previous cases, but the patient made a thorough recovery. Nine months after the operation I had the pleasure of showing this patient at the East Anglian branch of the British Medical Association. He was in perfect health, able to pass and to retain his

urine as well as he ever did. On December 30, 1905, four years after operation, he writes : ' I can both pass and retain urine quite comfortably and satisfactorily, thanks to your wonderful operation. Indeed, I have no pains now, and life has become worth living ; but, as you know, without your operation I could not have lived a fortnight.'

In a further lecture published in the *British Medical Journal* of July 26, 1902, I commented on this and cases of a somewhat similar nature in the following terms :

' In my previous lecture, in giving details of my eighth case of this operation, I described how, whilst endeavouring to separate the prostatic lobes along their anterior commissure so as to leave the urethra behind intact, the urethra was undesignedly torn across, and the prostate propelled as a whole into the bladder by the force of the finger in the rectum. This patient made an excellent recovery, and is now in good health, untroubled by any urinary symptom. The success that attended this case emboldened me to deliberately tear the urethra across in Cases 10, 11, and 14, and to remove a portion or the whole of the prostatic urethra, when it was found that the enlargement had not sufficiently advanced to define and loosen the lobes along either the anterior or posterior commissure, so as to enable one to peel the prostate off the urethra and leave the latter behind intact, with the successful results already described. The success that has attended these latter cases is of weighty import, indicating, as it does, that we may remove the prostate at an earlier stage in its growth, and that when it is found impossible to separate it from the urethra, we may, without hesitation, boldly tear across or even remove the latter with impunity.'

The details of Case 10 are as follows :

CASE 10.—C. C.—, aged fifty-nine, suffered from the usual prostatic symptoms for twelve years ; of great severity latterly, hæmorrhage accompanying the use of the catheter. Prostate much enlarged *per rectum*, rounded, scarcely bilobed, placed high in rectum. Cystoscopy

at St. Peter's Hospital on June 6, 1901, showed both lobes prominent in the bladder, and two small, oval, smooth, fawn-coloured calculi lying behind the prostate. Litholapaxy was at once performed, the uric acid debris weighing 42 grains. Recovery uneventful.

The prostatic symptoms continuing to increase in severity, on the advice of Dr. Collins, Peterborough, the patient returned in January, 1902; and on February 5 I removed the prostate (Fig. 62), weighing $2\frac{3}{4}$ ounces, as a whole, with the urethra attached. The patient was very ill for some days, with distended abdomen, pain and tenderness in the left loin and groin, causing much anxiety. These symptoms, however,

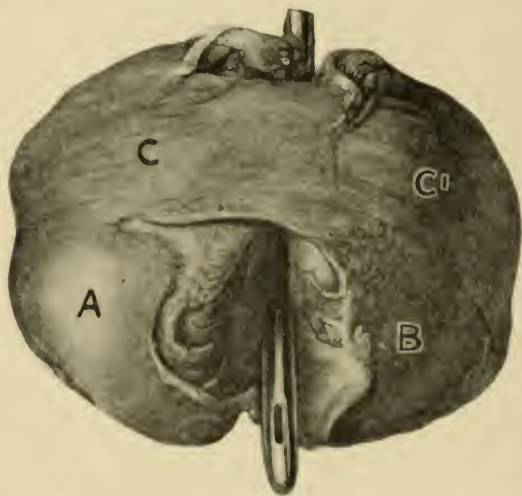


FIG. 62.—PROSTATE, WEIGHING $2\frac{3}{4}$ OUNCES, REMOVED FROM PATIENT AGED FIFTY-NINE (CASE 10).

A, B, Lateral lobes; C, C', muscular and fibrous band from sheath outside prostate.

subsided, and on February 17 some urine passed *per urethram*, but the suprapubic wound was not entirely closed till March 15. On March 24 he left for home quite well, passing and retaining his urine normally. On January 7, 1906, nearly four years after operation, he wrote: 'I am keeping in good health and have not lost a day's work for over nineteen months. I have had no urinary troubles since I saw you.' On February 13, 1906, he came to see me at the hospital in perfect health, able to pass and retain his urine, which was normal, as well as he ever did.

In my fourth, fifth, and sixth series of cases of the operation, published respectively in the issues of the *British Medical Journal* of November 8, 1902, April 18 and July 4, 1903, several instances are recorded of removal of the prostatic urethra with the entire gland. I will give an example from each series:

CASE 16.—General B—, aged sixty-seven, sent by Mr. Jowers, of Brighton, June 20, 1902. Prostatic symptoms for five years; latterly

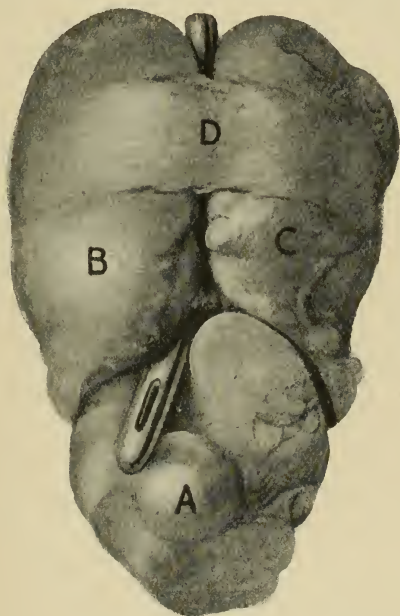


FIG. 63.—PROSTATE, WEIGHING $2\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-SEVEN (CASE 16). ACTUAL SIZE.

A, Tongue-shaped 'middle' lobe growing from lateral lobes, B, C, but mainly from left; B, D, band of sheath encircling lateral lobes.

combined with those of stone in the bladder. Great frequency of micturition by day and night, with intense pain; passing blood in urine for years. The passage of the catheter, which is employed three or four times daily, causes intense pain. Patient in a very miserable condition, utterly unnerved from the pain and want of sleep; constantly using narcotics; wears a urinal in bed.

Prostate much enlarged *per rectum*, bilobed, smooth, soft, tense, movable; urine alkaline, contains much pus and blood. Sounded, but no stone detected. Cystoscopy on June 23—Dr. Dudley Buxton, anæsthetist: Dr. J. Anderson, C.I.E., and Colonel Coates, I.M.S., present—revealed a large tongue-shaped outgrowth of the prostate in the bladder, and below this calculi lying like eggs in a nest.

I forthwith opened the bladder suprapubically and removed four smooth urate calculi, weighing over 2 drachms, from a pouch behind the prostate. I then enucleated the prostate (Fig. 63), weighing $2\frac{1}{2}$ ounces, as a whole. The latter failed to separate along its anterior commissure, so I tore the urethra across at the neck of the bladder, and peeled the prostate off the urethra. There was very little bleeding and no shock. During the first week the patient made excellent progress, being able from the first to move about in bed. Then some mental disturbance set in, which, however, passed off in a few days. Urine passed naturally July 10, and wound was completely closed July 25. I have met this patient frequently since then. He is now in excellent health, untroubled by any urinary symptoms.

CASE 28.—On November 16, 1902, I was summoned to Stockport to see a patient, aged sixty-three, in consultation with Dr. Hyde Marriott, of that place, and Mr. F. A. Southam, of Manchester. Prostatic symptoms had been present for seven years, the catheter having been used from two to four times daily for five years; latterly, this was attended by much difficulty of introduction and hæmorrhage. The patient had suffered from retention of urine in Brussels in the previous summer, when 26 ounces were drawn off by a Belgian surgeon. Subsequently profuse hæmorrhage had occurred, necessitating the tying in of a catheter for four days, when the patient's life was despaired of. Latterly the bleeding had increased in frequency, and when I saw him in consultation he was confined to bed from weakness caused thereby. I passed a coudée No. 8, and drew off eight ounces of blood-stained urine containing pus and mucus. The prostate was felt to be greatly enlarged *per rectum*, bilobed, smooth, tense, soft, and movable. In consultation it was decided that the case was one suitable for removal of the prostate, the only drawback being that the patient was very stout.

On December 4 he was sufficiently strong to travel to London, and on December 8 I removed the prostate, Major Freyer and Dr. Marriott assisting. The prostate came away entire, together with a thin layer of the recto-vesical fascia, or sheath, which was adherent from old-standing inflammation. The prostatic urethra was also removed. Nine minutes elapsed from the time of taking the knife in hand to open the bladder suprapubically to that of the prostate being delivered from the bladder. Some urine passed *per urethram* on December 20, and was wholly passed by this channel on December 24, after which the suprapubic wound did

not reopen, and convalescence was established without rise of temperature. The only interruption to the progress of the case was an attack of biliary colic with jaundice, for which the patient was seen by Sir Thomas Barlow with me; this gradually subsided. After January 3 1903, the patient walked out daily, and on the 8th he went home to

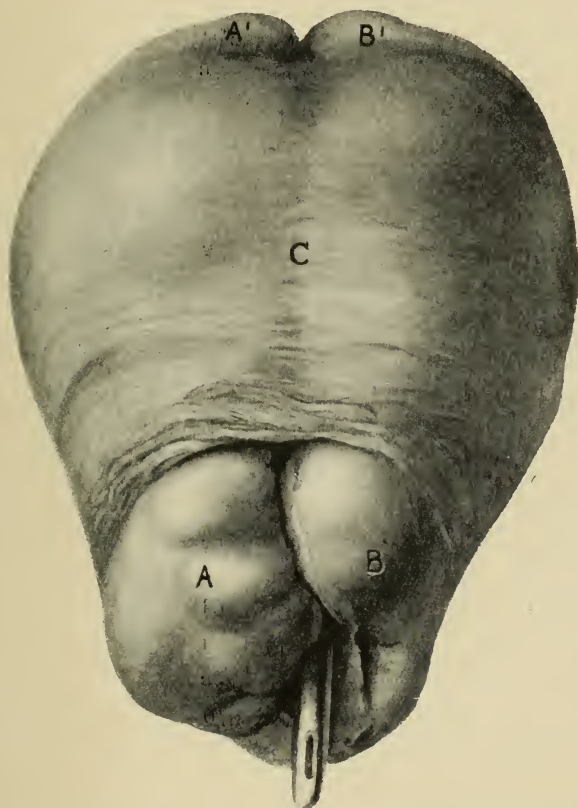


FIG. 64.—PROSTATE, WEIGHING $5\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-THREE (CASE 28). ACTUAL SIZE.

A, A', B, B', Lateral lobes covered by the true capsule and encircled by thin band, C, of the sheath, removed with the prostate.

Stockport, able to pass and to retain his urine naturally. I have seen this patient on several occasions since then. He is in perfect health, untroubled by any urinary symptoms, and is actively engaged in his business. On January 3, 1908, he wrote: 'I never felt better. I have

never felt ache or pain since the operation, or any ill-effects. I retain my water as well as ever I did, and have no trouble. I never passed it better in my life. I call it a complete renewal of life, and making one's latter days a very great pleasure. I stick to business, a good full ten hours a day, and enjoy it.' The prostate (Fig. 64) weighs $5\frac{1}{4}$ ounces.

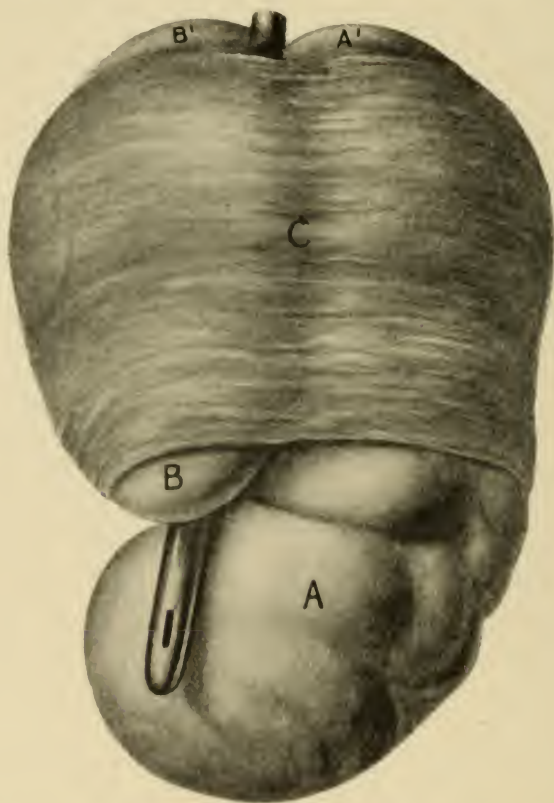


FIG. 65.—PROSTATE, WEIGHING $6\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED FIFTY-SEVEN (CASE 38). ACTUAL SIZE.

A, A', Enormously enlarged right lobe terminating in pistol-shaped projection, A, in the bladder; B, B', left lobe; C, thin band of sheath removed with the prostate.

CASE 38.—The patient, who was fifty-seven years of age, was admitted to St. Peter's Hospital March 10, 1903. He had had retention of urine six years previously, and the usual prostatic symptoms since then

gradually increasing. The catheter had been in habitual use for two years, and the urine had been entirely passed in this way for twelve months. There had been difficulty in passing the catheter. The prostate was much enlarged *per rectum*, bilobed, soft, tense, movable, and felt greatly enlarged bimanually.

On March 18 I removed the prostate (Fig. 65) entire. The capsule was adherent to the sheath, and in the enucleation a thin band of the latter (C) was removed with the prostate as well as a portion of the prostatic urethra. The patient made an excellent recovery; he began to pass urine naturally on the 30th, and the wound was dry on April 6. He was discharged on the 18th. I had the pleasure of showing the patient at the Medical Graduates' College in May, 1903, in perfect health, and able to pass and to retain his urine quite naturally. On July 1, 1904, he writes: 'I am glad to say that I have no urinary trouble, and that the operation was most successful, and my health has been good.' And on February 26, 1906: 'I am very well. The waterworks are in good going condition. I have not had any trouble with them since the operation.'

The prostate (Fig. 65), which weighs $6\frac{1}{2}$ ounces, is a fine specimen of the non-symmetrically enlarged organ, the right lobe (A, A') being enormously enlarged in the bladder, and forming a pistol-shaped valve (A) to the urethral orifice. The great size of the prostate is remarkable in a man of the age of the patient.

I have described the evolution of my views and procedure in this matter of the removal of the urethra with the prostate as a whole historically, because I have observed that in the *Annals of Surgery*, for January, 1904, a Leeds surgeon, without any recognition of my previously published writings on the subject, implies originality on his part for this procedure. In the paper referred to, this gentleman has assumed the rôle of critic of my work, and was therefore, it is to be presumed, acquainted with my published writings on the subject—a fact which renders his conduct in this matter all the more extraordinary. It is, indeed, a remarkable coincidence that even the phraseology employed by him in describing his imaginary discovery should happen to be practically the same in some instances as that employed by me in the above quotations from lectures published in the *British Medical Journal* about two, and one and a half years previously.

I have latterly almost completely abandoned the attempt to preserve the urethra entire in the enucleation of the prostate. The excellent permanent results obtained from partial removal of the urethra with the organ have convinced me that no advantage is to be gained by leaving the vesical end of the urethra behind. In a large proportion of cases of enlarged prostate this vesical end of the urethra is extremely dilated, being trumpet-shaped, or distorted out of any shape resembling a more or less circular tube as in the normal prostatic urethra. Even when it was left behind, I have always had my doubts as to its ultimate fate in most instances. The probability is that, through want of support and adequate blood-supply, it sloughed in large part, and came away in the washings during the after-treatment.

Examination of specimens of prostate which, in removal, have opened along the anterior commissure—to which category the great majority belong—will show that the dilated portion of the prostatic urethra—viz., that portion lying between the verumontanum and the vesical outlet, has come away with the prostate, the urethra in front of this being left behind. The portion of the urethra behind the point at which the ejaculatory ducts enter it is much more adherent to the prostate than that in front of it, between this point and the triangular ligament. In fact, in the greatly enlarged prostate this latter portion lies quite loosely attached to the lobes on either side. When such a prostate is enucleated in its capsule from the sheath all round, and the lobes are gently separated from the triangular ligament by the point of the finger, the organ can be felt hanging on by the urethra and ejaculatory ducts; and the finger-point can be easily inserted on either side between the inferior portion of the prostatic lobe and the urethra. If now the finger-tip be placed behind the prostate in the median line above the ejaculatory ducts, and the prostate be propelled upwards

into the bladder by the finger in the rectum, the urethra will be found to snap across at the verumontanum, leaving the ejaculatory ducts, as a rule, adherent to the portion of the prostatic urethra left behind.

II.—THE AFTER-TREATMENT OF PROSTATECTOMY.

With the delivery of the prostate from the bladder the essential part of the operation may be regarded as completed.

The forefinger of one hand is reintroduced into the bladder forthwith, and that of the other hand into the rectum. The opposing surfaces of the cavity, from which the prostate has been enucleated, are then pressed together all round the vesical orifice between the tips of the fingers. By thoroughly kneading the opposed surfaces together in this manner the contraction of the cavity, and its diminution in size, are facilitated, and hæmorrhage is thus arrested, just as a dentist presses the gum together after the extraction of a tooth, or the accoucheur does the flaccid womb after parturition, with a similar object in view.

The bladder is then irrigated with hot boracic lotion (temperature about 110° F.), through the catheter still *in situ*, for the purpose of removing clots and, further, to control bleeding. This process should not, however, be continued for more than two or three minutes, as I find from experience that these irrigations not unfrequently promote bleeding instead of diminishing it, if the irrigation be continued too long. This I attribute to the prostatic cavity being distended by the pressure of the fluid in the bladder.

The bladder having been cleared of clots, and whilst the irrigation is still proceeding, a stout indiarubber drainage-tube is introduced through the suprapubic wound. The dimensions and management of this tube I regard as of the utmost importance in the after-treatment of this operation.

I have been gradually increasing the calibre of this tube, till I now invariably employ $\frac{7}{8}$ -inch tubing, with a lumen $\frac{5}{8}$ inch in diameter. Two large perforations, or eyes, are made as near as possible to the vesical end of this tube (Fig. 66), on opposite sides of it. Only about an inch of the tube should project into the bladder, just sufficient for the side openings to lie completely within its cavity. When the bladder is allowed to contract, the tube is gripped by the suprapubic wound therein, so that the whole of the urine escapes through the tube. In this way infection of the loose tissues in the prevesical space is obviated, and cellulitis



FIG. 66.—SUPRAPUBIC DRAINAGE-TUBE. ACTUAL SIZE.

prevented. On no account should the tube be inserted into the prostatic cavity, our object being to facilitate by every means the contraction of this cavity. If more than an inch of the tubing be introduced into the bladder, it will press on its base and give rise to constant straining, and pain in the end of the penis like that caused by vesical stone.

The edges of the parietal wound are now brought together around the tube by silk-worm gut sutures, one or two of which should pass deeply through the recti muscles. On no account should buried sutures be employed, as they are certain to be infected by the urine. One of the sutures should pass through the drainage-tube to keep it securely in position. No sutures are inserted in the bladder.

Before withdrawing the catheter and applying the dressings the bladder is once more irrigated, in order to remove

clots and ascertain that drainage is quite free. Finally a couple of inches of broad iodoform-gauze tape are inserted in one angle of the wound against the side of the tube, and left there for twenty-four hours. This is done for the purpose of preventing the accumulation of fluids in the prevesical space. The wound is now covered with cyanide of zinc gauze and the patient deeply swathed in absorbent dressings—front, sides, and back. The whole dressing is kept in place by a broad flannel binder or many-tailed bandage, loosely applied. Cotton-wool, wood-wool tissue, or cellulose may be employed. The last is most absorbent and keeps the patient driest; but a thin layer of cotton-wool should be placed between it and the skin; otherwise the cellulose, when wet, forms a pulp, which adheres to the skin and feels cold and clammy. The dressings should be changed when saturated with urine, every four or six hours, according to the quantity of fluid secreted. During the first twenty-four hours after operation there will generally be some clots of blood lying in the drainage-tube; these should be removed by long slender forceps at each dressing.

The bladder should be irrigated once daily by the surgeon himself, with warm boracic lotion or a weak solution of permanganate of potash. For this purpose a long glass nozzle attached to the rubber-tubing of an irrigating-can is best, the nozzle being introduced through the drainage-tube. During the first few days there should be very little pressure of fluid on the bladder, the irrigating-can being held, or placed on a table, a little above the level of the patient's abdomen, so that the lotion flows into the bladder and out again through the drainage-tube with very little force. It is all-important that in the early days the drainage should be thoroughly free, and that no pressure should be thrown on the cavity from which the prostate has been removed; either by the accumulation of urine in the bladder or by pressure

from a high column of lotion, so that the cavity may remain at rest, and that blood-clot adherent to its surface may be undisturbed, thus obviating bleeding and facilitating the healing process. This is the main object with which I employ such a stout drainage-tube—that the urine and clots may escape through it freely, and that, consequently, there may be no straining, which would have the effect of dilating the cavity. Patients who pass no urine *per urethram* for ten or twelve days after operation almost invariably do best.

The patient should lie on his back for twenty-four hours, after which he should be placed alternately on either side, and on his back. During the first four or five days he should not be allowed to make any exertion, all movements being effected by nurses. Should there be any oozing of blood after the operation, the foot of the bed should be raised on blocks, and hypodermic injections of ergotin given. I have seen no hæmorrhage requiring more active measures in connection with this operation. Shock, when it occurs immediately after operation, should be treated by warmth from hot-water bottles, extra clothing, hypodermic injections of strychnia, and enemata of coffee and brandy. Pain or spasms of the bladder should be relieved by hypodermic injections of morphia. Should there be any bronchial catarrh or other lung-affection, the patient's head and shoulders should be well raised by pillows after the first twenty-four hours succeeding the operation. And in any case this position should be encouraged early, so as to obviate hypostatic congestion of the lungs.

As a rule I remove the tube four days after operation. If the patient be thin the tube may be dispensed with in three days; if he be very stout it should be left in for five days. By this time plastic lymph will have been thrown out round the tube, thus shutting off the prevesical space from contact with the urine, and in this way avoiding the occurrence of cellu-

litis. Before removal of the large tube, a smaller tube should be passed through its lumen and left in the fistula for a few days to facilitate free drainage from the bladder, the wound in which may then be allowed to close as rapidly as nature can accomplish this by granulation. The sutures are removed on the seventh or eighth day, by which time primary union will have taken place in the parietal wound, save, of course, in the track of the tube.

Irrigation of the bladder must be continued daily—twice daily, if the urine be at all foul—by inserting the long glass nozzle of the irrigator through the fistula right down into the viscus. The return stream will in the early days flow out beside the nozzle; but as the fistula contracts the nozzle will fill it; and the irrigation is then accomplished by alternatively filling the bladder with the lotion and then withdrawing the nozzle, when the fluid will rush out with more or less force. As the case advances more and more pressure on the bladder may be employed. The irrigation should be continued till the boracic lotion returns quite clear, or the permanganate lotion unaltered. After nine or ten days from the operation Janet's method of irrigation may be employed, if possible. This consists in introducing the glass nozzle into the urethra and gradually raising the irrigating-can till the column of fluid forces the lotion into the bladder and out through the suprapubic opening. This is, perhaps, the best method of flushing out the bladder; but some patients will not tolerate it, owing to the pain produced. It should never be employed during the first week after operation for fear of causing bleeding; and if it cause pain it should not be employed at all. Patients vary much in their tolerance of this method of irrigation.

After a fortnight or so, when the bladder is distended by lotion through the nozzle placed in the suprapubic opening, the patient will frequently pass the lotion *per urethram* as

rapidly as it enters the bladder. When this takes place, it is an effectual method of flushing out the bladder.

It will be observed that I have not hitherto referred to the employment of the catheter for the purpose of washing out the bladder during the after-treatment. In the early days after the introduction of this operation I was in the habit, as will appear from my previous lectures, of introducing a large-sized gum-elastic catheter through the urethra daily after the third or fourth day from the operation, and irrigating the bladder through this. The catheter was introduced partly in consequence of my apprehension that, if it were not thus employed, there might be contraction of the deep urethra during healing of the prostatic cavity. Experience has, however, taught me that my apprehension in this respect was quite unfounded, for in not a single instance has there been any contraction to interfere with the free flow of urine. I do not now introduce a catheter till the suprapubic fistula has contracted to such narrow dimension that it will not admit the nozzle, so that irrigation cannot be practised in this way. It is employed only during the few days before the patient begins to pass urine *per urethram* in volume, in order to keep the bladder clean during this transition period. When once natural micturition is established, the bladder is, of course, automatically flushed out.

The management of the bowels is of the utmost importance. For three or four days previous to the operation the bowels should be freely moved once daily at least, by means of a laxative pill given at night and a mild saline in the morning. On the morning of the operation the lower bowel should be emptied by means of an enema. The bowels should then be left undisturbed for two or three days, when they should be freely moved by castor-oil or liquorice powder—or any drug which can be depended on to act with certainty and efficiency. After this the bowels should be moved

gently once a day by means of a pill taken at night or a saline in the morning, or both if necessary. Patients of the prostatic age confined to bed are liable to the accumulation of fæces in the rectum, forming a hard mass, owing to the want of tone in the bowel. The occurrence of this is attended by much discomfort and spasm of the bladder from pressure thereon, and this must be guarded against. Should its presence be suspected, a finger should be introduced into the rectum, the mass broken down, and removed by an enema of warm olive-oil.

Patients should, as a rule, be confined to their room, but not necessarily kept in bed, for three or four days before the operation. Poor, broken-down hospital patients will require to be kept under observation for several days at least, in order that they may be fed up, and their general health improved before operation.

I have entered somewhat at length into the details of the after-treatment, because I consider that an intelligent appreciation of, and attention to, them is not less essential to success than the skilful performance of the operation.

Secondary Hæmorrhage.

Secondary hæmorrhage has occurred in a few instances. It is a very rare sequela of the operation, but has to be dealt with occasionally.

Slight arterial hæmorrhage may occur from the suprapubic wound on removal of the large drainage-tube on the fourth or fifth day. This is purely traumatic and due to the fact that the tube is gripped by the bladder. The utmost gentleness should be employed in removing the tube, which should be withdrawn slowly, and with a slight rotatory movement, should it be gripped very tightly by the wound. The bleeding from this cause is always trifling, and automatically ceases in a short time.

Should there be any obstruction to the free flow of the contents of the bladder through the tube during the early days after operation, the prostatic cavity is liable to be dilated, resulting possibly in venous hæmorrhage from its walls. This is controlled by readjusting the tube in such a manner that a free outlet is given to the urine, and by irrigating the bladder through the tube with boracic lotion as hot as the patient can bear.

But the most serious form of hæmorrhage takes place, strange to say, in the case of patients in whom the healing process is most rapid, resulting in the suprapubic wound closing earlier than usual. Urine is then passed *per urethram* before the prostatic wound is sufficiently healed to bear the resultant pressure on its surface, and hæmorrhage may take place owing to spasm of the bladder and the consequent undue pressure on the prostatic cavity. Should this occur, a full-sized rubber or gum-elastic catheter should be introduced through the urethra and tied in the bladder, so as to give free exit to its contents.

But should the hæmorrhage persist, giving rise to pain and spasm from the accumulation of clots in the bladder, no time should be lost in reopening the suprapubic wound, and in reinserting a large drainage-tube for a few days, to relieve the pressure on the walls of the prostatic cavity. Hypodermic injections of ergotin and the administration by the mouth of calcium chloride should also be employed. The following is an illustrative case of secondary hæmorrhage from this cause, and the method of dealing therewith.

CASE 185.—Gentleman, aged fifty-seven, seen with Mr. E. D. Madge, London, May 5, 1905. Prostatic symptoms for seven years; complete retention of urine in August, 1904; relieved by catheter, which had to be employed for some weeks, during which patient was laid up in bed with cystitis. Since this several attacks of pyrexia from urinary sepsis. Much blood in urine a fortnight ago. I introduced a catheter, and drew off 8 ounces residual urine, acid, specific gravity 1012, containing pus.

Prostate much enlarged, bilobed, smooth, soft, movable, easily felt bimanually. General health fair.

On May 15, Mr. Madge being present, I enucleated the prostate, weighing 2 ounces, entire in its capsule, the time occupied being three and a half minutes; scarcely any bleeding or shock. During the first fortnight there was not an unfavourable symptom; in fact, healing was more rapid than usual, urine being passed freely *per urethram* May 26, and the suprapubic wound being dry next day. On May 29, whilst straining at stool, some blood was passed in the urine, and this continued off and on for some days. The tying in of a soft catheter temporarily relieved the bleeding; but on June 3 large clots blocked the catheter, and there was much painful spasm and straining in spite of repeated washing out of the clots. I therefore reopened the suprapubic wound, which was firmly healed, under an anæsthetic, and inserted a large-sized drainage-tube. After this bleeding entirely ceased. The tube was removed after a week. On June 14 the suprapubic wound was quite healed, and all the urine passed naturally.

On June 24 patient left the surgical home, passing and retaining his urine as well as he ever did, and he is now in excellent health.

LECTURE IX

THE SCOPE AND LIMITS OF THE OPERATION OF TOTAL ENUCLEATION OF THE PROSTATE

IN the lectures and papers published by me from time to time during the past six and a half years I have given full details of most of my first 432 cases of this operation. In each instance I have described the physical characteristics which the prostate presented before operation, as ascertained on examination: (1) By the finger introduced into the rectum; (2) bimanually; and (3) in many instances by the cystoscope.

I have, however, hitherto refrained from placing before the profession at large* a comprehensive classification of cases suitable for the operation. I have done so designedly till I should have acquired experience derived from a sufficiently large number of cases to make the classification more or less exhaustive and practical; for as time has gone on I have been gradually extending the scope of the operation. I feel that now, with the accumulated experience derived from nearly 500 cases of the operation, I am in a position to answer a question that is frequently put to me: In what class of cases of enlargement of the prostate is total enucleation of the organ indicated?

* The substance of this lecture was embodied in the opening address for the session 1904-1905 of the Oxford Medical Society, which I had the honour of delivering, but which has never been published.

Now, this is a question which cannot be answered off-hand. In arriving at a classification of cases suitable for the operation, apart from the patient's age and general state of health, the following special considerations have to be taken into account. (1) The specific symptoms dependent on the prostatic enlargement; and (2) the nature, size, and general conformation of the prostatic growth.

I. The various types of patient suffering from prostatic symptoms that apply for surgical relief may be classified thus:

1. Patients suffering from the usual symptoms of enlarged prostate in the earlier stages of the malady, in whom not more than an ounce or two of residual urine is found on introducing the catheter.

2. Those who have probably suffered from prostatic symptoms for several years, in which we detect a quantity of residual urine varying from 3 to 10 ounces, or even more, but who have never employed a catheter for the purpose of emptying the bladder.

3. Those suffering from over-distension of the bladder, with great frequency of micturition, possibly continuous dribbling of urine, but who have never been relieved by a catheter.

4. Patients in whom the conditions described in paragraph (3) have culminated recently in complete retention of urine, and in whom great difficulty is experienced in introducing a catheter.

5. Patients, who from time to time have had retention of urine, which was relieved by catheter, but who have not employed the instrument as a routine practice to empty the bladder daily.

6. Those who for weeks, months, or years have daily emptied the bladder by the catheter, once, twice, or oftener, but who can pass more or less urine naturally.

7. Those entirely dependent on the catheter, and who, in the advanced stages of the disease, will probably have suffered from one or more of the following complications—viz., cystitis, hæmorrhage, vesical calculus, rigors with fever, and difficulty in introducing the instrument.

In the first of these types it will, as a rule, be unnecessary and inadvisable to attempt the removal of the prostate, because the enlargement of the organ will not have sufficiently advanced to render it prominent in the bladder, or to define adequately the lines of cleavage between the true capsule of the prostate and its enveloping sheath. But in one and all the other types the removal of the prostate should be entertained and advocated if on examination it presents those characteristics—to be presently described—that render its enucleation entire in its capsule practicable, there being no condition in the general health of the patient to bar an operation of this magnitude.

II. To ascertain whether the prostate is one capable of being enucleated entire, the patient, if capable of passing any urine naturally, is directed to empty his bladder as far as possible, and is then placed on a couch in the recumbent position. The bladder is now emptied of its residual urine by the aid of a catheter, and the quantity of residual urine noted. The forefinger of one hand, previously lubricated, is slowly introduced into the rectum, and, when the sphincter ani is thoroughly relaxed, a survey of the rectal aspect of the prostate is made. If the organ is found to be decidedly enlarged, presenting a well-marked tumour in the rectum, more or less rounded in shape, latterly bilobed with a well-marked groove or furrow in the median line, smooth on the surface, soft or somewhat dense and elastic to the touch, and, most important of all, movable, you know that you have to deal with the ordinary adenomatous enlargement of the gland of advanced life. If, in addition, from its promi-

nence in the rectum you estimate this tumour to be at least the size of a Tangerine orange, the case may be regarded as, in all probability, one in which the prostate is capable of being enucleated entire.

We next proceed to make a bimanual examination of the prostate. This is accomplished by placing the fingers of the unoccupied hand on the hypogastrium, and pressing them well down immediately behind the pubic arch, directing the patient at the same time to relax the abdominal muscles. Counter-pressure is made by the finger in the rectum. If the prostate be decidedly enlarged it will be felt between the fingers of the two hands, and can be slightly moved about, upwards, downwards, and from side to side, somewhat like a chronically enlarged uterus. If it be very prominent in the bladder, the outgrowth in that viscus will be easily recognised, and in thin subjects the origin of this outgrowth, whether from the right or left lobe, or from both. In thin or moderately stout patients this method of examination is easily accomplished, and is most helpful for diagnostic purposes. In very stout subjects it is unsatisfactory. Occasionally we meet with patients who cannot relax their abdominal muscles. In such cases the examination can only be satisfactorily accomplished under the influence of an anæsthetic.

If on bimanual examination the prostate, with the characteristics already described, be felt distinctly, we can at once conclude that the case is one in which the organ can be enucleated entire in its capsule, no matter to what magnitude it may have attained. Prostates weighing from, say, about 2 to 6 ounces, are those most easily and rapidly enucleated, as the following cases will illustrate:

CASE 49.—Gentleman, aged sixty-three, first consulted me November 29, 1902, on the advice of Dr. Fennings of St. Leonards-on-Sea. Prostatic symptoms for ten years. Catheter employed for six months. Much pain,

great frequency of micturition and straining, causing involuntary actions of the bowels. Very feeble constitution ; suffering from bad asthma and bronchitis. Prostate much enlarged *per rectum*, bilobed, soft, elastic, and movable. The case was regarded as a suitable one for operation, but postponement was advised till patient should get rid of the bronchitis, which he never did in winter.

Saw patient again in May, 1903, when the bronchitis had disappeared, but the asthma was as bad as ever. The prostatic symptoms had much

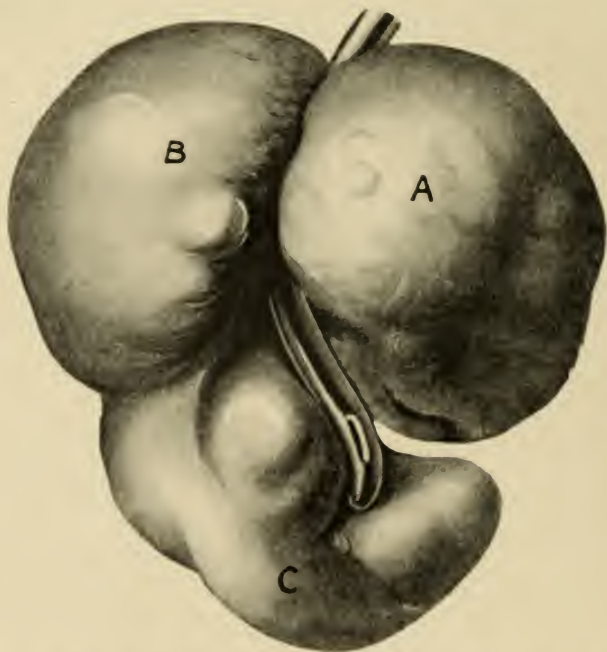


FIG. 67.—PROSTATE, WEIGHING $3\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-THREE (CASE 49). ACTUAL SIZE. *2H408*.

A, Right lobe ; B, left lobe, presenting a projection, C, into the bladder, the so-called 'middle lobe.' The catheter shows the tortuous course of the urethra.

increased. Catheter required three times daily ; residual urine, 8 to 10 ounces, containing much pus.

On June 8, 1903, Sir Joseph Fayrer and Mr. Walsham being present, I removed the prostate entire in its capsule, leaving the urethra behind. The patient was only eighteen minutes on the operating table, and the time occupied from commencing the suprapubic cystotomy till the

prostate was delivered from the bladder was five minutes. Scarcely any bleeding and no shock. The patient began to pass urine naturally June 20, though the fistula was somewhat slow in closing. He is now in excellent health, untroubled by any urinary symptom.

The prostate (Fig. 67), which weighs $3\frac{1}{4}$ ounces, is a most interesting specimen, presenting an irregularly curved outgrowth of the left lobe in the bladder (the so-called 'middle lobe'), which acted as a ball-valve to the inner orifice of the urethra.

CASE 53.—Gentleman, aged seventy-four, sent by Dr. J. Williamson, Richmond, July 22, 1903, with prostatic symptoms of seven years' duration. Retention a fortnight previously, and no urine since then passed naturally. Owing to impossibility of introducing the catheter,

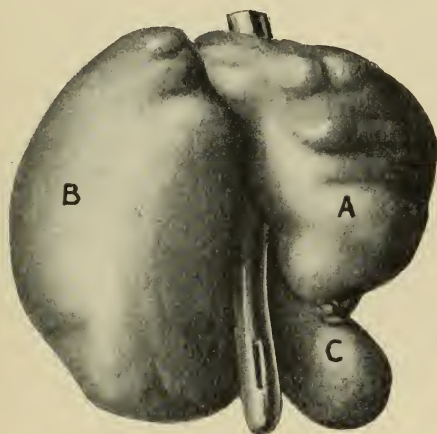


FIG. 68.—PROSTATE, WEIGHING $1\frac{3}{4}$ OUNCES, REMOVED FROM PATIENT AGED SEVENTY-FOUR (CASE 53).

A, Right lobe, contained a nipple-shaped projection, C, in the bladder ;
B, left lobe.

bladder tapped suprapubically a week before. Patient very thin and in feeble health. Urine contains much pus and blood. Prostate enlarged *per rectum*, soft, smooth, movable.

On July 24, Dr. Williamson, Mr. Boyce Barrow, Major J. F. Blood, and others being present, I removed the prostate entire in its capsule, leaving the urethra behind, the time occupied from commencing the operation till the prostate was delivered from the bladder being only two minutes. There was very little bleeding and no shock. The patient recovered without any unfavourable symptom. On March 19, 1906, he wrote : 'I never cease to think of you, and at night to bless you, for such a restoration—as perfect as can be.'

The prostate (Fig. 68), which weighs $1\frac{3}{4}$ ounces, presents a well-marked so-called 'middle lobe,' which is merely an outgrowth of the right lobe in the bladder.

CASE 112.—A gentleman, aged sixty-two, consulted me on June 29, 1904, on the advice of Dr. R. G. Pollock, Tiverton. Prostatic symptoms for three years. Retention of urine two years previously and on several

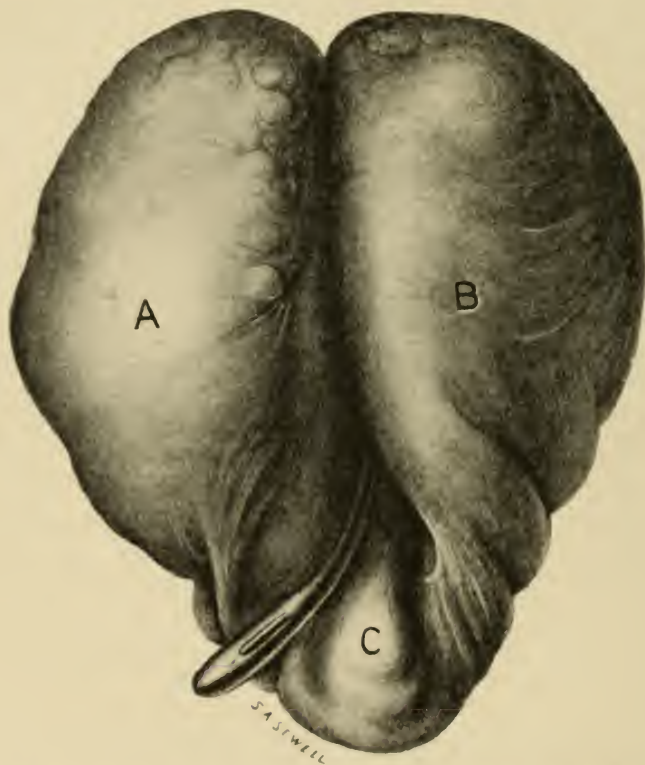


FIG. 69.—PROSTATE, WEIGHING $6\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-TWO (CASE 112).

A, Left lobe; B, right lobe, giving off an outgrowth, C, in the bladder. Catheter shows tortuous course of urethra.

occasions within the next year; relieved by catheter. Dependent on catheter for one year. Repeated attacks of cystitis, orchitis, and hæmorrhage, with clots blocking the catheter; much pain. Prostate greatly enlarged *per rectum*, bilobed, smooth, tense, elastic, movable. Easily

felt bimanually ; the size and shape of a large pear. Urine contained pus, blood, and albumin. Patient very stout ; general health fair.

On July 4, Lieut.-Colonel D. French-Mullen, I.M.S., and Dr. Laing Gordon, of Florence, being present, I enucleated the prostate entire in its capsule, leaving the urethra behind. Time from commencing the operation till the prostate was delivered from the bladder, six minutes. More bleeding than usual, but no shock ; uninterrupted recovery. Passed some urine naturally on July 22 ; wound closed on July 26. Went home in good health on August 5 ; able to pass and to retain his urine, which was normal, as well as he ever did. On January 6, 1908, he writes : ' I

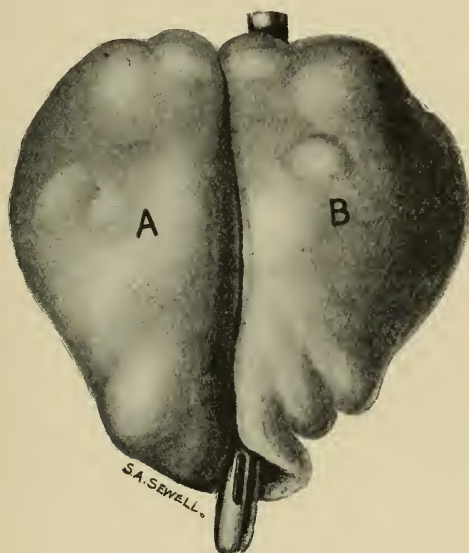


FIG. 70.—PROSTATE, WEIGHING $1\frac{3}{4}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-SEVEN (CASE 133).

A, Left lobe ; B, right lobe.

am able to retain and pass urine without any difficulty ; and I now turn the scale at 212 pounds, which is heavier than I have ever been before.'

The prostate (Fig. 69), which weighs $6\frac{3}{4}$ ounces, is a fine specimen of symmetrical adenomatous enlargement. Two-thirds of the prostate projected into the bladder.

CASE 133.—J. N.—, aged sixty-seven, sent by Dr. Duckworth Barker, Bexhill, admitted to St. Peter's Hospital, October 4, 1904, for prostatic symptoms of four years' duration. Had retention of urine on four occasions ; relieved by catheter. Residual urine, 8 ounces, containing some pus and albumin. Had 'a stroke' three months previously, affecting

the whole of left side and speech, from which he had only partially recovered. Prostate felt enlarged *per rectum*, bilobed, smooth, soft, movable; bimanually felt to be size of a Tangerine orange.

On October 12 I had the honour of operating in presence of Professors Poirier, Hartmann, Lucas-Championnière, Reynier, Proust, and many other distinguished French surgeons during their visit to London. The

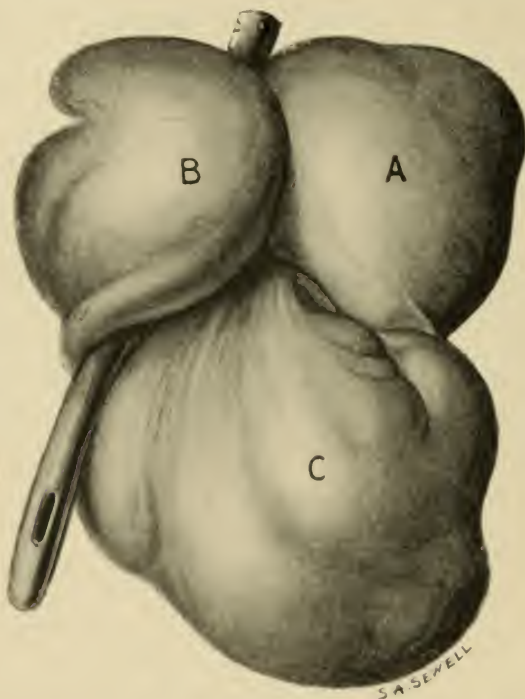


FIG. 71.—PROSTATE, WEIGHING $3\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-SEVEN (CASE 193).

A, Right lobe, terminating in bladder in the outgrowth, C, so-called 'middle' lobe; B, left lobe.

prostate (Fig. 70) was easily and rapidly enucleated entire in its capsule, the urethra behind the verumontanum coming away with it, the time occupied from commencing the operation till the prostate was delivered from the bladder being three minutes. Scarcely any bleeding or shock. The prostate, which was symmetrically enlarged, weighed $1\frac{1}{4}$ ounces.

Uninterrupted recovery, some urine passing naturally November 2, and the wound being dry November 4. Patient returned home quite

well November 25, passing and retaining his urine as well as ever he did. On January 20, 1905, Dr. Barker wrote : ' The operation has been a great success. He can hold his water all night with comfort, and can go for four to six hours during the day without any difficulty.' On March 5, 1905, the patient wrote : ' I am keeping perfectly well.'

CASE 193.—This gentleman, aged sixty-seven, who had come from California on the advice of Dr. Tom Davis, Los Angeles, for the purpose of having his prostate removed, consulted me on May 31, 1905. Prostatic symptoms had existed fifteen years. Retention of urine six years ago, since when he has employed the catheter ; entirely dependent thereon four years. Has had repeated attacks of cystitis, and latterly difficulty in introducing the catheter. The prostate was much enlarged *per rectum*, bilobed, smooth, soft, movable ; easily felt bimanually, being very prominent in the bladder. General health fair ; thin, but wiry.

On June 5, in the presence of Professor J. Kaarsberg and Drs. A. Helsted and A. F. Just, of Copenhagen, I removed the prostate entire in its capsule rapidly and easily, the time from commencing the suprapubic incision till the prostate was delivered from the bladder being three minutes. There was practically no bleeding and no shock.

The recovery was uneventful, some urine being passed naturally on June 16, and entirely in this way after June 22. By June 29 he was walking about, passing and retaining urine, which was quite clear, as well as he ever did. Writing from California on November 19, 1905, his wife says : ' My husband is perfectly well and completely cured. He has not had the slightest trouble since he left the home. He goes to bed about ten o'clock, and is not disturbed till seven or eight in the morning.'

The prostate (Fig. 71), which weighs $3\frac{1}{4}$ ounces, is an interesting specimen, displaying a large so-called 'middle' lobe (C) the size of a Tangerine orange, growing mainly from the right lobe. This portion, which lay entirely in the bladder, was merely covered by mucous membrane.

But prostates of larger sizes can be similarly dealt with, though those attaining to enormous dimensions present considerable difficulties, mainly owing to their being impacted beneath the pubic arch, and to the difficulty experienced in reaching with the finger the distal portions of the growth—those in proximity to the rectum and triangular ligament—to separate the capsule from the enveloping sheath. I will now give details of some instances of very large prostates removed by me, illustrating the difficulties encountered, and the manner in which these difficulties may be surmounted.

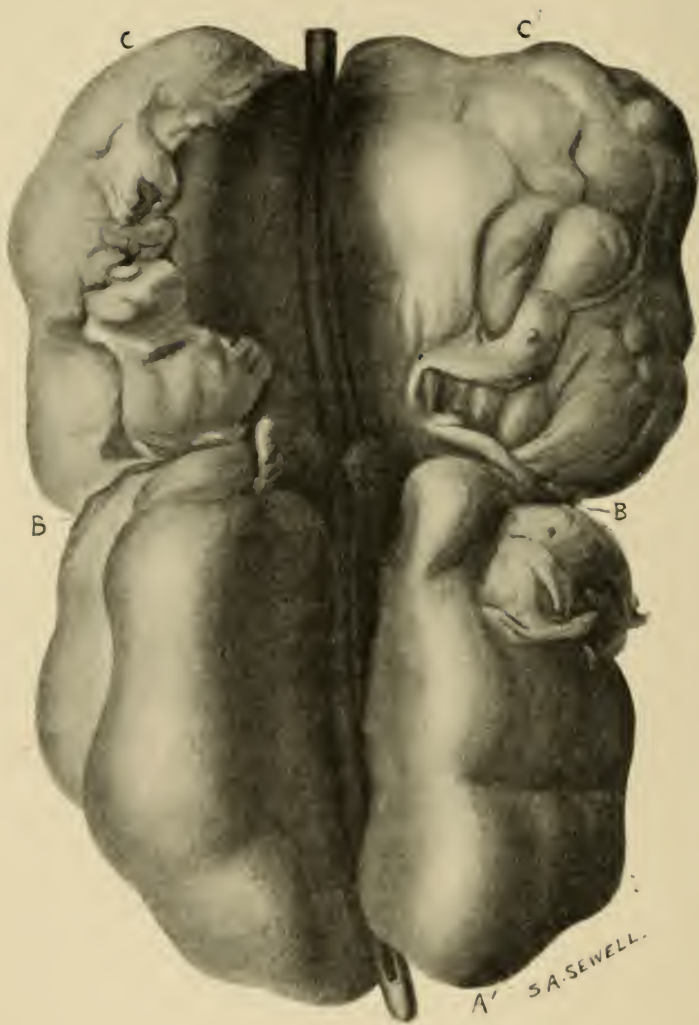


FIG. 72.—ENORMOUS PROSTATE, WEIGHING $10\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED SEVENTY-FIVE (CASE 5). EXACT SIZE.

The catheter shows the position occupied by the urethra. Portion A, A', B, B', lay in the bladder, and B, B', C, C', lay outside the bladder.

CASE 5.—This gentleman, aged seventy-five, came from France for operation on the advice of the late Dr. R. Cox, of Reading, and Dr. J. A. Philip, of Boulogne. Completely dependent on the catheter for fourteen years. Repeated attacks of cystitis and hæmaturia. Much difficulty in introducing the catheter, which latterly he had to use every half-hour night and day. A specially long catheter was necessary, from 14 to 16 inches being introduced before the urine flowed. The urine was putrid from pus and blood, and the patient was emaciated and in great agony. As Dr. Philip wrote: 'It was only his fine constitution that enabled him at his age to survive a period of martyrdom which was increasing in severity.' The prostate felt enormously enlarged *per rectum*, and the kidneys were tender and probably much affected.

On September 6, 1901, with Mr. C. Braine as anæsthetist, I removed the entire prostate (Fig. 72) in its capsule in the manner already described. The operation lasted half an hour. There was no collapse, and on waking from the anæsthetic the patient began to laugh and joke. The temperature never rose above 100° F., and remained normal after September 12. Six ounces of urine passed naturally on October 7, and the wound had closed by the 17th. On November 3 he returned to France. On April 14, 1903, he wrote: 'I am perfectly well with regard to my bladder, and suffer no pain or inconvenience from it, and pass my urine as well as I ever did before the prostate troubles.' In September, 1907, six years after the operation, I spent part of a day with him in France; he was then in excellent health, and as fine a man of his age as one could meet. On January 17, 1908, he writes: 'My waterworks are all right, and I feel as well in that respect as I ever did in my life, and am wonderfully well for my age.'

The prostate (Fig. 72) is an enormous one, weighing 10½ ounces.

CASE 106.—On June 4, 1904, I was called to Ipswich to see, in consultation with Dr. Branford Edwards, a gentleman, aged seventy-three, who had suffered from prostatic symptoms for over fifteen years. Retention of urine in 1889; relieved by catheter. Entirely dependent on catheter for ten years, during which has had repeated attacks of acute cystitis and hæmorrhage. Calculi crushed on three occasions by another surgeon, the last being in February, 1904, since when the patient has been much worse, requiring a permanent nurse. Catheter used every two hours; bladder washed out three times daily. Still, urine very foul, containing much pus and mucus and some blood. Much difficulty in introducing catheter, which passes in 14 inches before the urine flows. Patient in a very miserable condition, requiring opiates to relieve pain. Prostate enormously enlarged *per rectum*, filling the space between the pubic arch and the sacrum, round, tense, smooth, scarcely movable owing to its size. Examination gave much pain.

On June 14 I enucleated the prostate entire in its capsule, Mr. C. Braine, anæsthetist, Drs. Edwards and Brown of Ipswich and Professor

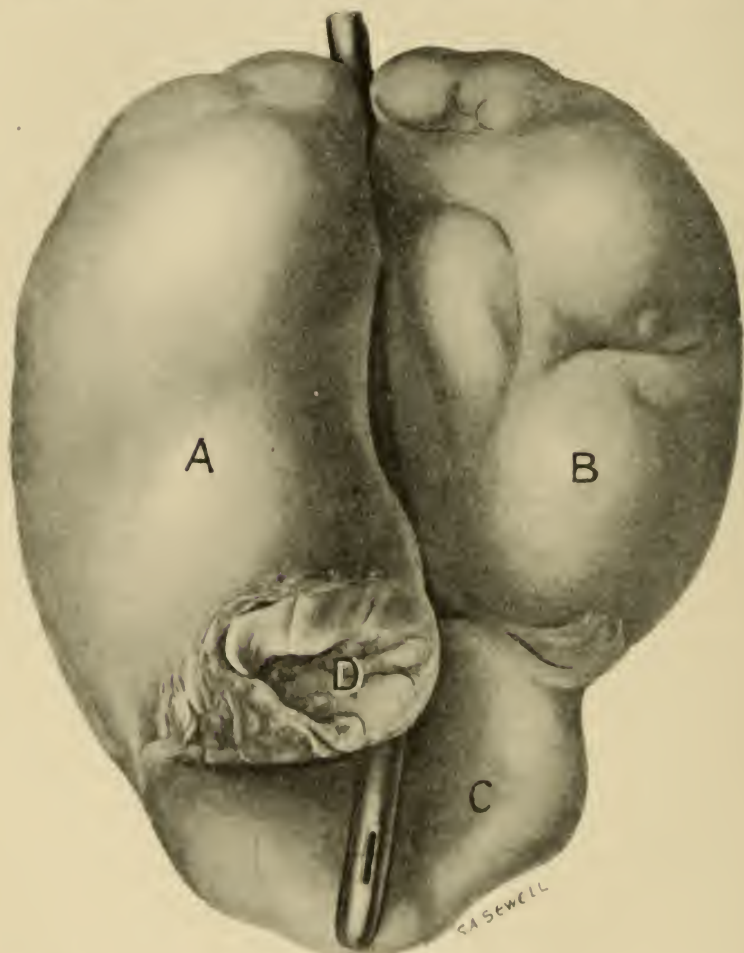


FIG. 73. — ENORMOUS PROSTATE, WEIGHING $14\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED SEVENTY-THREE (CASE 106). ACTUAL SIZE.

A, Left lobe, showing an ulcer at D, caused by vesical calculus ; B, right lobe ; C, saucer-shaped lip connecting the lateral lobes, and prominent in bladder.

Eye of Galway being present. On opening the bladder suprapubically I found both lobes (Fig. 73, A and B), enormously enlarged, filling its

cavity. They were more or less symmetrical, separated by a deep fissure in front, continued forward to the vesical neck, and united behind by a thick, prominent, scoop-shaped lip (C). I could pass my finger down behind the prostate between it and the base of bladder for a space of 4 inches, and in this position lay much phosphatic débris embedded in thick muco-pus. The prostate was enucleated as a whole into the bladder after severe manual, or rather digital, labour, great difficulty being experienced in separating the capsule from the sheath owing to the great size of the gland and its being jammed between the pubic arch and sacrum, like the foetal head in parturition. The suprapubic wound in the bladder had to be enlarged, and the lobes separated by the finger to facilitate delivery of the prostate. There was scarcely any bleeding—a remarkable fact considering the enormous size of the prostate. There was no shock, the patient being cheerful, even jocular, during the day. Time occupied from commencing the suprapubic wound till the prostate was delivered from the bladder, fourteen minutes.

Recovery uneventful; in fact, patient felt no ill-effects after the operation, the temperature remaining normal throughout. Passed 4 ounces of urine naturally July 4; wound closed July 12. Went home July 19 in excellent health, able to pass and retain his urine as well as he ever did. On January 3, 1908, he wrote: 'I am perfectly well. I can pass water with the greatest comfort, and can retain it from three to four hours. I have perfect control over it. I am really strong, and can walk four or five miles without feeling tired. I am up to my normal weight of 13 stones 2 pounds. When I returned home after the operation I only weighed 10 stones 6 pounds. I am leading a most comfortable life.'

The prostate (Fig. 73) weighs $14\frac{1}{4}$ ounces, and is the largest I have removed. It is a fine specimen, enucleated complete in the capsule. The lateral lobes (A, B) are almost symmetrical, and united behind by a thin, saucer-like lip (C), which interfered much with the introduction of the catheter. At D, the vesical end of the left lobe, is an ulcer, no doubt caused by pressure of a vesical calculus. The labour involved in removal of this prostate was very severe, and my fingers, hands, and arms ached for two or three days owing to the muscular exertion necessary.

CASE 180.—Gentleman, aged sixty, seen in consultation with Dr. J. J. Macgregor, of London, April 11, 1905. Has had difficulty in micturition twelve years. Ten years ago catheter passed, followed by rigors. Since then has employed catheter regularly; entirely dependent thereon for eight years. Has had orchitis twice, cystitis repeatedly, and hæmaturia occasionally. Patient's condition very distressing; great loss of flesh and appetite during last two months; extreme dryness of mouth and throat; urine turbid, specific gravity 1010, contains pus and

albumin; prostate enormously enlarged, bilobed, smooth, soft, rather dense, but movable; easily felt bimanually.

On April 21, Dr. Silk being the anæsthetist and Dr. Macgregor assisting, I removed the prostate entire. On opening the bladder the prostate was found projecting into it like an enormously hypertrophied

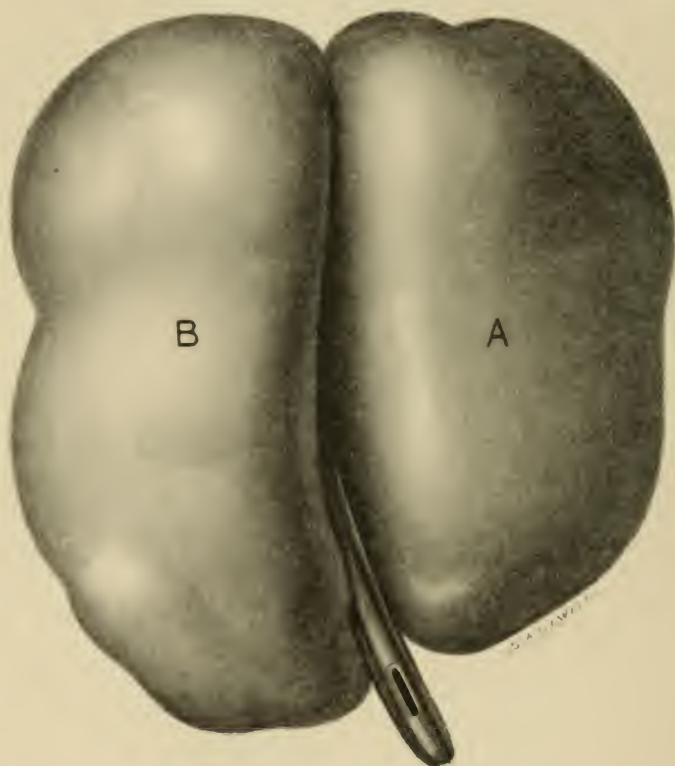


FIG. 74.—PROSTATE, WEIGHING $8\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY (CASE 180).

A, B, Right and left lobes respectively. The transverse constriction is the boundary between the intravesical and extravescical portions.

cervix uteri, the left lobe being more prominent than the right. The inner orifice of the urethra was distorted into an irregular deep slit between the lobes. The enucleation was easily accomplished, but much difficulty was experienced in delivering the prostate from the bladder. Eventually it was grasped by one lobe and withdrawn like an open oyster.

There was considerable bleeding, and the time occupied was eight minutes, five of which were spent in delivering the prostate from the bladder. Some urine was passed *per urethram* May 22, but the suprapubic wound was slow in closing. It was thoroughly healed by June 7, after which all urine was passed naturally. The patient left for home on June 21 in excellent health, passing and retaining his urine, which was quite clear, as well as he ever did. On March 4, 1906, he wrote: 'I continue to be in good health. I retain urine, and, in fact, have no difficulty now.'

The prostate (Fig. 74), which weighs $8\frac{1}{2}$ ounces, is a fine specimen of almost symmetrical enlargement of both lobes. The enormous size of the gland, considering the age of the patient, is very remarkable. It is obvious that the enlargement had considerably advanced before the age of fifty.

Let us now contrast the characteristics of adenomatous enlargement of the prostate with those of cancer of that organ in a more or less advanced stage. In carcinomatous enlargement we find on rectal examination that the prostate is mainly hard—of stony hardness in most instances—with possibly soft, boggy patches due to broken-down tissue. The outline will, as a rule, be irregular, the lobes being ill-defined, and the median furrow partially or wholly obliterated. In such cases the organ will be nodular or ridged, with intervening deep, irregular furrows. But occasionally the cancerous prostate will be smooth and globular, like an ivory ball. Most important of all for diagnostic purposes, the prostate will be immovably fixed in the pelvis, owing to the invasion by the growth of the surrounding tissues. Bimanual examination will confirm the presence of these characteristics; but, as a rule, in cancer of the prostate no great prominence of the organ will be felt inside the bladder, the growth invading the surrounding tissues rather than advancing into the bladder. We will have, as additional aids to diagnosis, the enlargement of the glands in the groins in advanced stages of the malady; and at an earlier stage small glands, like sago grains, may be felt *per rectum* covering the surface of the tumour beneath the mucous membrane; the

clinical history of the case—viz., the rather sudden inset and rapid advance of the usual prostatic symptoms; the progressive loss of flesh; the feeling of lassitude, debility, and undue fatigue; the failure of appetite; the typical cachexia; and the pains in the loins, sacrum, and lower limbs, the result of pressure on the nerves, so characteristic of this disease.

It is impossible to enucleate a cancerous prostate in this advanced stage, owing to the extension of the disease to the adjacent tissues.

In the earlier stages of the malady, however, whilst the prostate is still movable and the surrounding structures uninvolved, the gland can, and should, be removed, my experience of operation under such conditions being most favourable. It is, however, impossible to give a definite diagnosis of malignancy before removal of the gland in cases of this kind, though the presence of dense nodules in the prostate, combined with the rapid progress of the symptoms, will arouse suspicions in the surgeon's mind, suspicions which, I need scarcely say, should be communicated to the patient's relatives before operation is undertaken.

It is, however, when we have to deal with adenomatous enlargements of smaller dimensions—say, less than $1\frac{1}{2}$ ounces in weight—that the greatest difficulties present themselves to the surgeon's mind as to the possibility of their enucleation entire being practicable; for I may say, as the records of my published cases prove, that you may find absolute and complete dependence on the catheter, with a prostate weighing $1\frac{1}{2}$ ounces, 1 ounce, or even less. A prostate of 1 ounce in weight will scarcely feel enlarged *per rectum*, and, of course, it cannot be felt bimanually. The only way in which we can determine the possibility of enucleating a prostate of this size is by the aid of the cystoscope. If on cystoscopic examination we find that there is a well-defined outgrowth of

one lobe, or marked prominence of both lobes, in the bladder, the case may be pronounced to be one permitting of enucleation of the gland entire, no matter what its size may be as felt *per rectum*. I will give details of some examples of the kind :

CASE 66.—Gentleman, aged fifty-six, seen in consultation with Mr. John Langton, Harley Street, November 6, 1903. Prostatic symptoms for two years. Cystoscopic examination attempted a year previously, but unsuccessfully, owing to bleeding. Intense frequency of micturition by day and night so that sleep was impossible. Condition most miserable. Much averse to using catheter ; in constant dread of retention. Residual urine only 2 ounces, clear, healthy. Prostate palpably enlarged, bilobed, soft, movable. We made a cystoscopic examination, November 7, with difficulty, as bleeding again set in ; but the view eventually obtained revealed a thumb-like outgrowth of the right lobe of the prostate in the bladder. I at first counselled postponement of operation till the prostate should have grown larger, and thus become more easy of removal ; but Mr. Langton, who knew of the patient's sufferings, both physical and mental, was averse to delay, and eventually it was decided to operate at once.

Operation, November 9. On introducing my finger into the bladder the right lobe was found projecting inwards for $\frac{3}{4}$ inch. The prostate was easily and rapidly enucleated, only four minutes elapsing from commencing the suprapubic incision till the gland was delivered from the bladder. Rapid and uneventful recovery, urine passing naturally November 27, and the wound being dry December 1. On December 3 he left the home perfectly well, able to retain his urine for five or six hours, and to pass it naturally—'not so well since he was a boy,' as the patient expressed it. On January 4, 1908, he wrote : 'I have had no trouble whatever in retaining and passing urine since I saw you.'

The prostate (Fig. 75), which weighs 1 ounce, is a pretty specimen, and shows the thumb-like outgrowth from the right lobe in the bladder, which no doubt acted as a foreign body, giving rise to irritation, and acting as a ball-valve to the urethral orifice.

CASE 93.—Eminent public man, aged seventy-two, seen with Dr. P. F. Barton, Wimbledon, March 26, 1904. Did not notice any urinary troubles till November, 1903, when he had great frequency of micturition with foul urine, and great distension of the abdomen. Catheter passed, and $5\frac{1}{2}$ pints of fetid urine drawn off. Entirely dependent on catheter since then ; urine never free from pus ; contains albumin and casts. Prostate not felt enlarged *per rectum*, but cystoscopic examination on April 13

revealed an outgrowth therefrom in the bladder. Health indifferent ; had lost 17 pounds in weight in a few months.

On April 19, Dr. F. Hewitt anæsthetist, I removed the prostate, weighing $\frac{3}{4}$ ounce, entire in its capsule (Fig. 76). There was a lower lip, $\frac{1}{2}$ inch long, projecting in the bladder, and acting as a valve to the inner orifice, which was also stenosed. Urine commenced to pass naturally May 14 ; wound closed May 22. Went home May 28, able to pass and retain urine normally. I have seen the patient recently ; he is in good health, and able to pass and retain urine as well as ever.

CASE 182.—Gentleman, aged sixty, sent by Dr. J. F. Wolfe, Heavitree, suffering from the usual prostatic symptoms for five years. Catheter

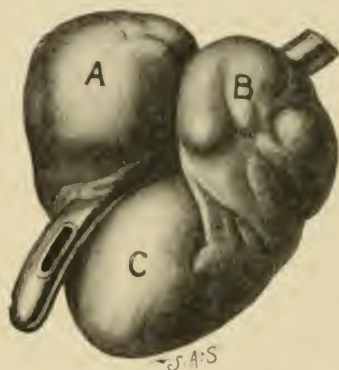


FIG. 75.—PROSTATE, WEIGHING 1 OUNCE, REMOVED FROM PATIENT AGED FIFTY-SIX (CASE 66).

A, Left lobe ; B, right lobe ; C, finger-like outgrowth in bladder from right lobe. Catheter indicates course of urethra.

passed daily in December, 1904, but abandoned because patient could not introduce it himself. Cystitis then set in, accompanied by intense pain and frequency of micturition, which continued till I saw him in April, 1905. I drew off 28 ounces residual urine, which was alkaline, and contained pus and mucus, specific gravity 1010. Patient had lost much flesh, and intense thirst was a prominent symptom, as I find it is frequently when chronic over-distension of the bladder is present.

On April 27, 1905, I enucleated the prostate (Fig. 77) entire in its capsule, the weight being $\frac{3}{4}$ ounce. The prostate was very dense, but showed no signs of malignancy. Urine commenced to pass naturally May 16, and the wound was closed May 19. On May 29 he left for home, able to pass and retain urine naturally. On January 3, 1908, he writes :

'My general health is very good. I am able to pass urine freely, and to retain it at will.'

This (Fig. 77) is one of the smallest prostates I have removed. It is a perfect specimen, complete in its capsule.

CASE 149.—On September 24, 1904, I examined a patient, aged fifty-seven, sent by Dr. Latham, of Cambridge. He had suffered from prostatic symptoms for seven years. Six years ago he had retention of urine, which was drawn off by the catheter, on which he had been practically dependent ever since. He has had repeated attacks of cystitis, hæmorrhage, and orchitis. The urine contained pus and albumin, but was acid; specific gravity 1015. The prostate was not felt much enlarged *per*

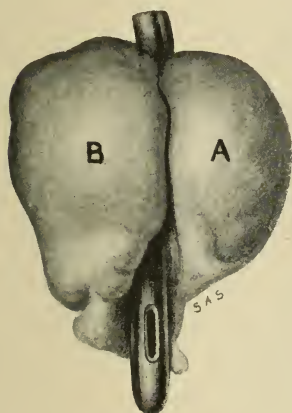


FIG. 76.—PROSTATE, WEIGHING $\frac{3}{4}$ OUNCE, REMOVED FROM PATIENT AGED SEVENTY-TWO (CASE 93).

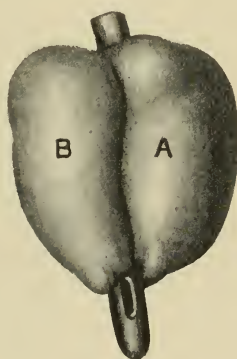


FIG. 77.—PROSTATE REMOVED FROM PATIENT AGED SIXTY (CASE 182).

rectum, but bilobed, dense, and movable. Bimanually it was felt projecting in the bladder. On the patient's return home he had a severe attack of cystitis with pyrexia, which prevented his coming to London for operation till the middle of November.

On November 23 I enucleated the prostate, which weighed $1\frac{1}{4}$ ounces, entire, easily and rapidly, the time occupied being five minutes. The prostate presented in the bladder in the form of two polypoid outgrowths (Fig. 78, B, A), that from the right lobe being the size of a plum, and that from the left the size of a cherry. These two outgrowths were separated from the main body (C) of the prostate by a narrow neck produced by constriction of the sphincter muscle, a portion of which came away with the prostate.

The recovery was uninterrupted save for a slight swelling of one testicle. Urine passed *per urethram* on December 12, and the wound was dry December 18. On December 29 he went home in good health, able to pass and retain his urine naturally. On January 7, 1908, he writes: 'I am glad to say there is no difficulty in passing and retaining urine. All is well. My operation is a perfect success.'

A question which will naturally suggest itself is this: How is it that prostates of these sizes—which, indeed, are not

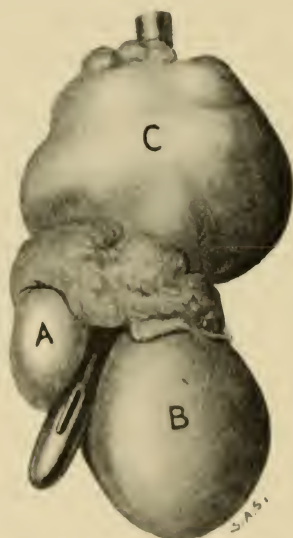


FIG. 78.—PROSTATE, WEIGHING $1\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED FIFTY-SEVEN (CASE 149).

A and B, Outgrowths in the bladder from the right and left lobes respectively, separated from the main body, C, by a narrow neck.

much larger than that set down in the text-books as the average of the normal prostate—can give rise to serious symptoms, possibly culminating in complete retention of urine and dependence on the catheter? The explanation will be found in the following considerations.

1. The late Sir Henry Thompson found from examination of some two hundred prostates dissected by himself and

Dr. Messer, of the Royal Naval Hospital, Greenwich, and assumed to be normal, that the average weight was about $4\frac{1}{2}$ drachms. But this included the weight of the sheath formed from the recto-vesical fascia, whereas the latter is left behind in my operation. The average weight of the prostate included in its true capsule, exclusive of its sheath, which corresponds to what is removed in my operation, would be considerably less than this. Now, some of the prostates referred to weighed only from 2 to 3 drachms, whilst others weighed 6 or 7 drachms. The portion included in the true capsule of a prostate weighing with its sheath 2 drachms would probably not weigh more than $1\frac{1}{2}$ drachms. This, if hypertrophied to a size weighing 1 ounce, would be relatively as enlarged, and might cause just as severe symptoms, as a prostate of 6 drachms hypertrophied to 3 or 4 ounces, and might be as easily enucleable.

2. The obstruction caused by an enlarged prostate does not altogether depend on its size. Of more importance, indeed, in this connexion would seem to be the tightness with which it is bound down by the encasing sheath of recto-vesical fascia, and the extent and conformation of the outgrowth in the bladder. We have seen that in Case 93, already recorded, a prostate weighing only $\frac{3}{4}$ ounce, situated mainly extravescically, and tightly compressed by its surrounding sheath, caused complete obstruction to the flow of urine for six months previous to operation; whereas a prostate enlarged to several ounces in weight may give rise to little trouble for many years, provided that the encasing sheath be loose, elastic, and yielding, or that in the course of its enlargement the organ escapes from its natural extravescical position, and becomes mainly intravesical, being thus set free from the encircling grip of the sheath. Prostates thus displaced into the bladder may afford no evidence of enlargement to the finger placed in the rectum, but will, as

a rule, be detected on bimanual examination, or by the cystoscope. The following are instances of this abnormal type :

CASE 36.—Sir J. D—, a distinguished member of the medical profession, aged seventy-one, seen at Putney in consultation with Mr. E. White on February 28, 1903. Three years previously had painless hæmaturia for fourteen days without apparent cause. Remained quite well since then till January 21, 1903, when bleeding again set in, at first intermittent, but latterly continuous, which necessitated his remaining in bed for the last three weeks. At times the bleeding was very profuse, almost pure blood passing. The only other symptoms were great frequency of micturition since taking to bed, not before ; some pain at the neck of bladder ; and uneasiness in the loins, particularly the left. The catheter had latterly been passed twice daily and the bladder washed out. Rapid loss of flesh with anæmia during last few weeks. The patient had been seen several times by Dr. Allchin and Mr. Makins, by whose advice I was called in consultation.

I drew off 15 ounces residual urine containing much blood. Sounded, but no stone detected. Prostate somewhat enlarged *per rectum*, but not at all prominent. Bimanually some fulness felt in the bladder, of an indefinite nature. The cause of the hæmorrhage was thus very obscure, and grave apprehensions were entertained by the medical gentlemen mentioned and myself that its source was a growth either of the bladder or kidney.

The patient was conveyed to London by ambulance, March 2, and kept in bed in a surgical home, under the observation of Mr. Makins and myself. Rest and astringents for a week had little or no effect in reducing the bleeding, and the latter rendered diagnosis by the cystoscope impossible. Examination of the kidneys by the X rays negative. Eventually we came to the conclusion that the hæmorrhage was due either to a growth in the bladder or an outgrowth of the prostate, so we determined to open the bladder suprapubically for diagnosis and such measures as might be found advisable.

On March 9, Mr. White giving the anæsthetic, and Mr. Makins kindly assisting in consultation, cystoscopic examination revealed an irregular mass in the bladder ; but the view became so rapidly obscured from the bleeding that no definite opinion as to its nature could be formed. Suprapubic cystotomy was forthwith performed, and on introducing my finger I found, happily, that the growth consisted of a very decided outgrowth from both lobes of the prostate, united below, and forming a U-shaped or cart horse collar projection in the bladder. The lower lip of this projected $1\frac{1}{4}$ inches beyond the neck of the bladder. The prostate

was easily and rapidly enucleated entire in its capsule, the urethra being left behind. There was very little bleeding or shock. The patient made a most satisfactory recovery, passing some urine naturally March 29, and the wound being quite dry April 1. On April 8 he left for home in good health, retaining and passing urine quite naturally. Since the operation there has been no trace of hæmorrhage.

On January 3, 1908, five years after the operation, the patient wrote : 'I have no urinary troubles whatever, am never disturbed at night, and can retain and pass urine naturally. In other respects, too, I am quite well.'

The prostate, which weighs $2\frac{1}{2}$ ounces, is an excellent specimen of symmetrical adenomatous enlargement of the organ. The case is a remarkable one from many points of view, but particularly in regard to the masked character of the prostatic symptoms. There were really no external signs or symptoms to indicate prostatic mischief, as, though there was a large quantity of residual urine, this did not give rise to the usual symptoms of frequency of micturition till the patient took to bed. It has to be noted that there was profuse hæmorrhage from the prostate long before a catheter was employed, due, no doubt, to a varicose condition of its veins.

CASE 105.—Gentleman, aged seventy-one, sent by Dr. A. Emson, Dorchester, consulted me June 6, 1904. Symptoms only dated from ten months previously, when he had retention, relieved by catheter, which was used twice daily for a fortnight. After this urine passed naturally, and patient remained fairly well till six weeks previously, when retention again occurred. Catheter passed occasionally since then; hæmorrhage and much pain from catheter; micturition every two hours; residual urine 12 ounces; contained much pus and blood; general health very bad; pulse irregular and intermittent. Prostate scarcely felt enlarged *per rectum*, but an enormous mass palpable bimanually, and cystoscopic examination revealed an enormous outgrowth in the bladder.

On June 13, assisted by Dr. Emson, Dr. Guthrie, Stirling, being also present, I enucleated the prostate (weighing $10\frac{1}{2}$ ounces) entire in its capsule. On opening the bladder suprapubically its cavity was found filled by an enormously enlarged prostate, with an irregular gaping urethral orifice, overhung above and on the left by a massive overgrowth of the left lobe (Fig. 79, A), and on the right by a large mass projecting from the right lobe (B), behind which was an ovoid polypoid outgrowth (C). The right and left lobes were separated by a deep, gaping fissure. The prostate, which was almost entirely intravesical, was easily enucleated entire, the lobes opening out posteriorly, but remaining united in front by a broad band (D). There was considerable bleeding, which, however, soon ceased; operation borne well. There was some secondary

hemorrhage on June 23, and again on June 26, but the patient steadily improved : began to pass urine naturally July 3, and in volume July 10 ; wound closed July 12 ; sitting up daily for a week previously ; drove out daily after July 12 ; went home July 21, in fairly good health, untroubled by any urinary symptom. On January 4, 1908, he writes : 'I am quite

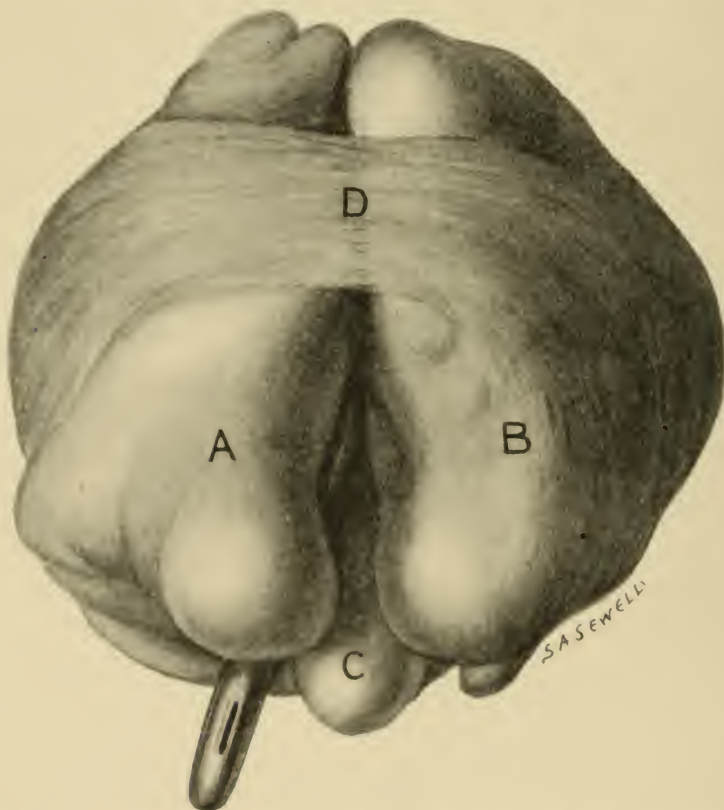


FIG. 79.—PROSTATE, WEIGHING 10½ OUNCES, REMOVED FROM PATIENT AGED SEVENTY-ONE (CASE, 105). ACTUAL SIZE.

A, Left lobe ; B, right lobe ; C, polypoid outgrowth from right lobe ; D, thin band of sheath removed with prostate.

well again, and can get about easily ; free from pain, and retain and pass urine as well as ever.

The extremely feeble condition of this patient gave cause for considerable anxiety, especially as the kidneys were undoubtedly much affected ;

and the complete recovery is remarkable, taking this fact and the enormous size of the prostate into consideration.

The short duration of the symptoms, and the patient's not being reduced to dependence on the catheter, are also very singular facts, considering the great size of the prostate. These circumstances I attribute to the enlarged prostate being almost entirely intravesical, so that the lobes were not bound down by the recto-vesical fascia, and lateral pressure on the urethra was thus obviated to a large extent.

What a strange contrast this case presents to others that I have recorded, in which comparatively slight enlargements of the gland, weighing from $\frac{3}{4}$ ounce to 1 ounce, caused complete retention and dependence on the catheter, owing, I believe, to their being compressed by some peculiar formation of the recto-vesical fascia, which does not allow of free expansion of the prostate.

There is a further form of enlargement of the prostate, which is partly adenomatous and partly inflammatory, occasionally met with, in which the patient becomes entirely dependent on the catheter, though the prostatic enlargement has not attained to any considerable dimensions. These are the cases in which, during an attack of cystitis, resulting from chill or other cause, the inflammation extends to the incipiently enlarged prostate, resulting in retention of urine. A catheter is passed for relief of this retention, and not unfrequently the obstruction remains a permanent bar to natural evacuation of the urine. These are the cases, I presume, that are commonly spoken of as instances of 'fibroid' prostate. They are capable of being removed entire, if well defined, or projecting into the bladder. But one cannot assure the patient beforehand of a perfect result, as in ordinary adenomatous enlargement of the prostate of advanced age, for in some of these cases the bladder never regains the power of completely emptying its contents naturally, there being a certain quantity of residual urine left behind. Fortunately, such cases are rare.

LECTURE X

I.—TOTAL ENUCLEATION OF THE PROSTATE IN ADVANCED OLD AGE

ONE of the most remarkable features of the operation of total enucleation of the prostate is the success that has attended its employment in advanced old age. Amongst some 500 patients on whom I have performed the operation there were 37 octogenarians, varying in age from eighty to eighty-nine years, and 8 bordering on this period of life, aged seventy-nine years, in all of whom, except five, the results have been completely satisfactory. In one of the fatal cases there was malignant disease of the bladder, though the prostate was adenomatous apparently; in another the case was complicated by vesical stone of twelve years duration and disease of the kidneys. It would thus appear that age has little influence on the result of the operation provided that the vital organs, and particularly the kidneys, are unaffected or fairly sound. Nevertheless, patients of this advanced age cause much anxiety; and the operation should not be undertaken in such cases unless the most careful and tender nursing is available, as well as the constant personal supervision of the surgeon. I will give details of several of these cases, as they are most interesting.

CASE 46.—A well-known public man, aged eighty-one, seen in consultation with Dr. H. L. Macevoy, Brondesbury, May 3, 1903. Prostatic symptoms for ten years, gradually increasing in severity. Retention of

urine four years previously, relieved by catheter, which has been employed ever since. Great frequency of micturition, intense pain at times, and hæmaturia. Seen from time to time by various London surgeons. Double vasectomy in 1900, but with no relief. Condition extremely miserable during last six months. I drew off 8 ounces residual urine containing much pus and blood; difficulty in introducing the catheter. Prostate enormously enlarged *per rectum*, soft, tense, and movable. Cystoscopy on May 4 revealed an outgrowth of the left lobe of the prostate in the bladder, the size of a plum. Patient in very feeble health and confined to bed.

On May 13, Mr. C. Braine being the anæsthetist, Mr. Thomson Walker and Dr. Macevoy assisting, and Colonel W. H. Henderson, I.M.S., being present, I removed the prostate entire in its capsule, the urethra being left behind. Some trouble was experienced in the enucleation, owing to stoutness of the patient, the finger with difficulty reaching the aspect of the gland towards the triangular ligament. Time occupied from commencing the suprapubic wound till the prostate was delivered from the bladder, thirteen minutes. There was very little bleeding and no shock.

Uneventful recovery, the temperature remaining normal throughout. Some urine passed naturally June 2, and wholly in this way June 5. Patient went home June 8, twenty-six days after operation, retaining and passing his urine naturally, and he is now in excellent health, untroubled by any urinary symptoms. On May 29, 1906, three years after operation, he writes: 'I am pleased to tell you I have no trouble whatever with passing my water, thanks to your treatment, and I feel very well otherwise.'

The prostate (Fig. 80), which weighs $5\frac{1}{4}$ ounces, is an excellent specimen of almost symmetrical adenomatous enlargement of that organ.

CASE 67.—Gentleman, aged eighty-one, was seen with Mr. C. T. Knox Shaw on October 29, 1903. Prostatic symptoms had been present for thirty years and gradually increasing. The catheter had been passed in June, 1901, showing 13 ounces of residual urine. Cystitis supervened in August, with much pus in the urine and rigors. The catheter was passed five or six times daily in November, 1902. The sound was passed under an anæsthetic in July, 1903, by another surgeon, but no stone was found. The patient had been entirely dependent on the catheter since then, with much pain and occasional bleeding. His general health was bad. The prostate was greatly enlarged *per rectum*; it was broad, soft, nodular, and movable.

On November 19, Mr. Shaw and Colonel C. Little, I.M.S., being present, I removed the prostate entire in its capsule with several small

calculi from the bladder. There was considerable bleeding, and the patient was feeble for some days after the operation. By the 29th the suprapubic wound had closed so rapidly that it was necessary to reinsert a small tube to prevent spasm of the bladder. This was removed on December 6, and on the same day the patient began to pass urine naturally. The wound was closed on the 11th. On the 16th he went out for a walk. He is now, $4\frac{1}{2}$ years after operation, in good health and able to retain and to pass his urine naturally. On January 3, 1908, he writes :

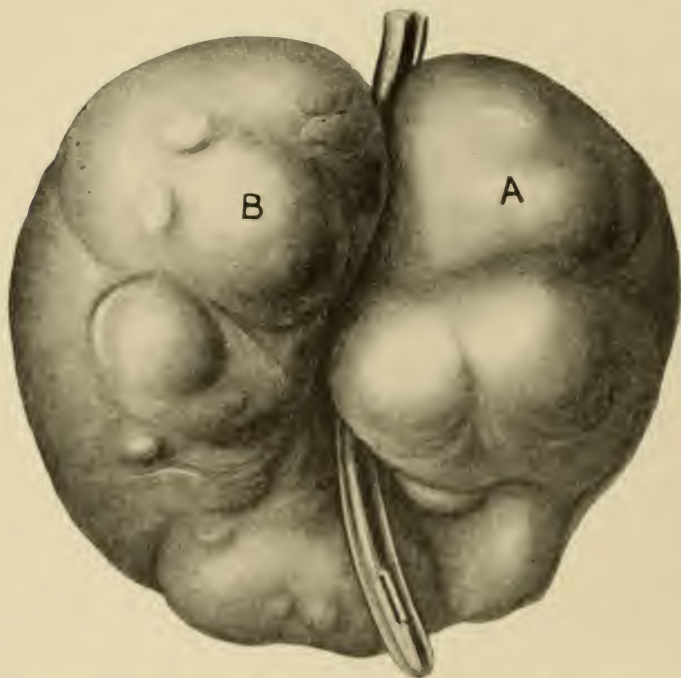


FIG. 80.—PROSTATE, WEIGHING $5\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED EIGHTY-ONE (CASE 46).

A, Right lobe ; B, left lobe. Catheter lies in position occupied by urethra.

'I have had no appreciable trouble with my waterworks since the operation in November, 1903. I have never, from that date, had occasion to be otherwise than grateful to you for the comfort thus acquired, and, happily, since maintained.'

The prostate (Fig. 81) weighs $4\frac{1}{2}$ ounces, and is irregularly enlarged and bossy, the left lobe having been more prominent in the bladder than the right.

CASE 70.—Captain M—, aged eighty-seven, was seen with Dr. H. E. Bruce Porter, of Windsor, on November 22, 1903. Prostatic symptoms had been present for eight years. The catheter had been employed for six years, and the patient had been entirely dependent thereon for five years; it was passed every two hours. The urine contained much blood and ropy muco-pus; it was alkaline and fetid. The catheter passed in $13\frac{1}{2}$ inches before the urine flowed; a stone could be felt grating against its end. The prostate was enormously

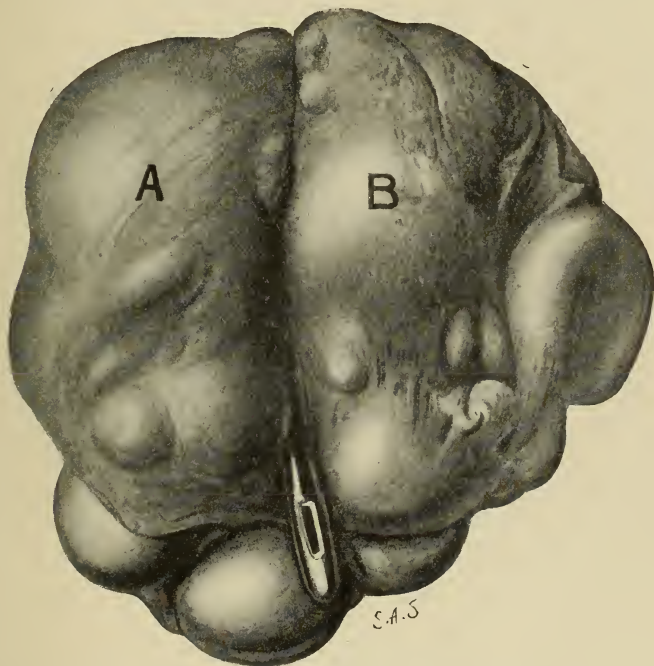


FIG. 81.—PROSTATE, WEIGHING $4\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED EIGHTY-ONE (CASE 67).

A, Left lobe; B, right lobe.

enlarged *per rectum*; it was roundly bilobed, smooth, soft, and movable. The patient was emaciated, bearing the impress of terrible suffering 'Life not worth living under present condition,' as he put it; morphine was given daily to mitigate the pain. He had an intermittent and irregular pulse; the arteries stood out like whipcords all over his body. Rigors and fever occurred periodically. He came to London on November 27, and his bladder was washed out twice daily. On December 4,

Mr. C. Braine being the anæsthetist and Dr. Porter assisting, I opened the bladder suprapubically, and found two phosphatic stones, which were removed; they weighed $2\frac{1}{2}$ drachms. Both ureters were dilated to such an extent that the index-finger passed readily into them. The prostate was felt to be of the size and shape of a cricket-ball, and was jammed beneath the pubic arch, half of it lying in the bladder and half outside. It was enucleated entire in its capsule. Much force was required to

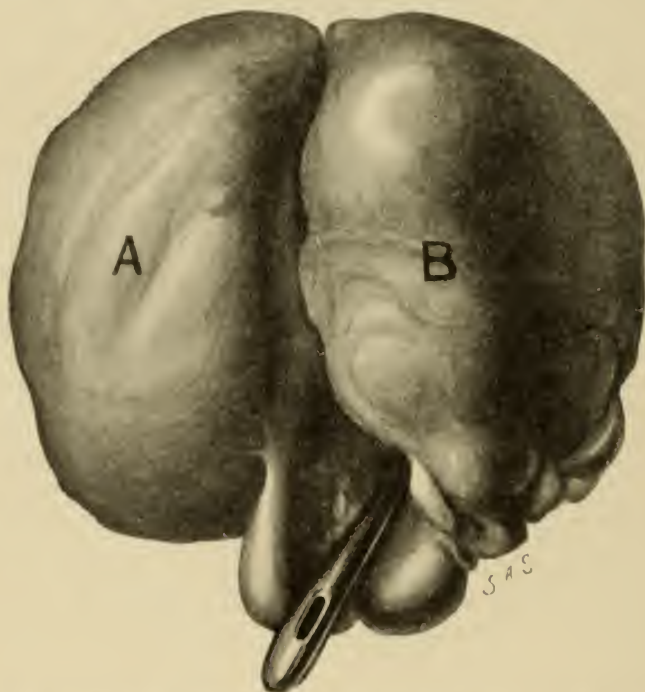


FIG. 82.—PROSTATE, WEIGHING $6\frac{1}{2}$ OUNCES, REMOVED FROM PATIENT AGED EIGHTY-SEVEN (CASE 70).

A, Left lobe; B, right lobe. Each showing an outgrowth in the bladder.

separate it from the surrounding sheath. The time from commencing the suprapubic cystotomy till the prostate was delivered from the bladder was seven minutes. There was scarcely any bleeding or shock. The drainage-tube was removed on December 7. There was not an unfavourable symptom. No morphine had been given since the operation. 'Talk of the pains of an operation,' said the patient; 'the last four days have been holidays from pain amongst many years.' He sat up daily

after December 16. He passed urine naturally by December 20. The wound was dry on the 23rd, and the patient was walking about. On January 2, 1904, he travelled home in good health and spirits, passing and retaining his urine naturally. He stated that he felt twenty years younger than his age—a truly grand old soldier who was present in the Suttle and Burmese Wars of 1845 and 1852. On May 11, 1904, his wife wrote: ‘He is now enjoying life free from any pain and discomfort.’ On September 8, 1905, Dr. Bruce Porter wrote: ‘Our poor old mutual patient, Captain M——, died of old age. From the time you did your operation on him his life was a new one. He at once passed from absolute torture to absolute comfort. He was in mind and body years younger. After nearly two years of comfortable life, subsequent to operation, his circulation failed. His vessels were, as you know, like pipe-stems.’

The prostate (Fig. 82), which weighs $6\frac{1}{4}$ ounces, is a fine specimen of symmetrical enlargement with a small outgrowth in the form of a lip below the orifice of the urethra.

This is one of the oldest patients on whom I have performed this operation, and I submit that the result was a great surgical triumph considering his age, the large size of the prostate, the weak state of the patient, the presence of chronic cystitis with formation of phosphatic calculi, the dilated condition of the ureters from backward pressure, indicating a probability that the kidneys were much diseased. In spite of all this, there was complete restoration to health and function of the bladder.

CASE 85.—Gentleman, aged eighty-two, was seen with Mr. J. L. Hewer, of Highbury New Park, on March 2, 1904. Prostatic symptoms had been present for twenty years, and the patient had been entirely dependent on the catheter for ten years. He experienced great difficulty and pain in introducing the catheter latterly, two hours being frequently spent in manipulating the instrument before it passed. He had had frequent attacks of cystitis, hæmorrhage, and orchitis, and had undergone seven operations for vesical calculus. He had inguinal hernia requiring a truss. The prostate was much enlarged, soft, tense, and movable; it could be felt bimanually. The urine contained pus and mucus.

On March 7 I removed the prostate entire in its capsule, Mr. Hewer assisting. The time occupied was six minutes. The operation was well borne. Recovery supervened without any unfavourable symptom, the temperature remaining normal throughout. Urine passed naturally on the 23rd, and the wound was dry on the 25th, eighteen days after operation. The patient is now in excellent health, attending to his business daily. On July 19, 1904, he wrote to me: ‘The result of your operation has been entirely satisfactory. I am now able to pass and retain the urine as well as I ever did.’ And on January 3, 1908: ‘My next birthday I

shall have completed my eighty-sixth year, and am glad to say I am enjoying the best of health.'

The prostate (Fig. 83), which weighs $5\frac{1}{4}$ ounces, presented a large tongue-shaped outgrowth in the bladder growing from the right lobe. The rapidity with which the wound closed is remarkable in a patient aged eighty-two.

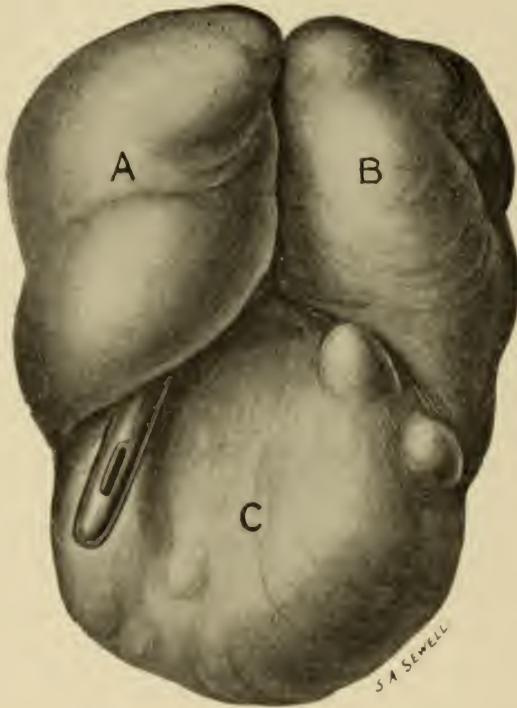


FIG. 83.—PROSTATE, WEIGHING $5\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED EIGHTY-TWO (CASE 85).

A, Left lobe; B, right lobe, presenting a tongue-shaped outgrowth, C, in the bladder.

CASE 96. - Eminent scientist, aged eighty-one, was seen with Mr. H. Huxley on February 17, 1904. Prostatic symptoms had been present for five years. The patient was in great distress with an over-distended bladder. I passed a catheter and drew off 55 ounces of fairly clear urine. The prostate was much enlarged, rounded, smooth, and movable. His general health was good. He passed some urine naturally for a few days, but eventually he was completely dependent on the

catheter. He was seen again with Mr. Huxley on May 3, when he travelled to London for operation, as catheter life was unbearable. His health was bad, and he was very feeble. Rapid loss of flesh had taken place during the last two months.

I enucleated the prostate on May 6. The gland was scarcely prominent in the bladder; it was firmly bound down by its sheath. There was

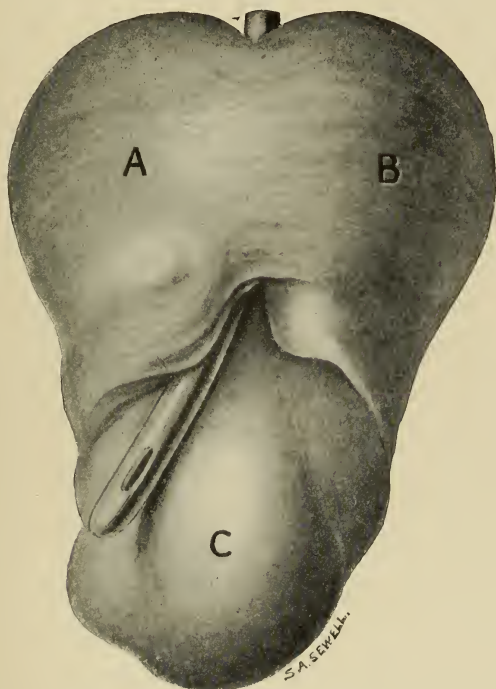


FIG. 84.—PROSTATE, WEIGHING 4 OUNCES, REMOVED FROM PATIENT AGED EIGHTY-TWO (CASE 124).

A, Left lobe; B, right lobe, prolonged into bladder in polypoid form, C.

hardly any bleeding. The prostate weighed $2\frac{1}{2}$ ounces. Progress was most favourable till May 10, when a severe attack of gout set in, followed by severe inflammation of the parotid glands, which, however, did not suppurate. Though the wound kept clean throughout, progress was slow, owing to the weak state of health. Urine was passed naturally by June 2, and entirely, *per urethram* by the 11th. The patient left the surgical home on the 16th, and on the next day the suprapubic wound reopened. A catheter was tied in till the wound closed again. I heard from this

gentleman on January 3, 1908, three and a half years after operation, and he is in excellent health. He can pass and retain his urine normally.

CASE 121.—Gentleman, aged eighty-two, seen with Dr. Randell, Beckenham, August, 10, 1904. Catheter employed for prostatic obstruction eight years, latterly four times daily, a little urine being passed naturally every two hours with much straining. Hæmorrhage, cystitis, and orchitis from time to time. Catheter introduced with difficulty. Prostate greatly enlarged *per rectum*, bilobed, soft, smooth, movable; felt bimanually, the size of a large orange. Health feeble. Inguinal hernia requiring a truss.

On September 15, Mr. C. Braine being the anæsthetist, Dr. Randell assisting, Drs. de Havilland Hall (London) and Renny (Colchester) being present, I enucleated the prostate entire in its capsule easily and rapidly in four minutes. Very little bleeding; no shock. The recovery was uninterrupted, urine passing naturally October 12, and the wound being dry next day, after which it did not reopen. Seen by Dr. de Havilland Hall October 23, in excellent health, able to pass and retain urine as well as he ever did. Left for home on October 24. On January 26, 1905, he wrote: 'I am quite well, and as active as ever,' and on January 10, 1908: 'It is $3\frac{1}{2}$ years to-day since I was in your hands for the operation, which in my case, as in many others, has proved a very real blessing. I can look forward without anxiety to what remains of life. I have never touched a catheter since the operation.'

The prostate (Fig. 84), which weighs 4 ounces, presented an outgrowth in the bladder the size of a large plum, growing from the right lobe.

CASE 174.—Eminent scientist, aged eighty-two, seen in consultation with Mr. G. H. Makins and Dr. E. A. Roberts, London, March 25, 1905. He had suffered for fifteen years from prostatic symptoms, the most pronounced of which was gradually increasing frequency of micturition. A catheter had been passed on March 23 and $1\frac{1}{2}$ pints of urine drawn off. Next day the temperature rose to 101° F., and there was much difficulty in passing the catheter. I introduced a coudée No. 8 with some difficulty, and drew off 15 ounces of thick urine containing pus and mucus; specific gravity low. The prostate *per rectum* was much enlarged, broadly bilobed, smooth, soft, movable; felt bimanually. Patient thin but wiry; high-tension pulse. Bowels moved when he strained to pass urine. Obtained scarcely any sleep from constant desire to pass water. The case was regarded as one very suitable for removal of the prostate; but, as the patient was suffering from acute septic absorption from the bladder, we considered that it would be advisable to postpone operation, if possible, till this condition should have passed off. But the difficulty and pain attending the introduction of the catheter decided us on fixing

the operation for March 28. On March 26, however, the temperature rose to 102° F., and this was accompanied by nausea, vomiting, loss of appetite, drowsiness, and scanty secretion of urine; there was, in short, partial suppression of urine. Under these circumstances we decided to postpone operation for the time, lest the shock attending it might cause complete suppression of urine. The patient was extremely disappointed at the postponement, became much depressed, and his strength began rapidly to fail. We consequently decided that the proper course was to risk operation, the extreme gravity of the situation being fully placed before his relatives.

On March 29, in consultation with Mr. Makins and Dr. Roberts, Dr. Hewitt being the anæsthetist, I removed the prostate, both lobes of which were very prominent in the bladder. The enucleation was easily accomplished, the time occupied from commencing the suprapubic incision till the prostate was delivered from the bladder being six minutes. There was scarcely any bleeding and no apparent shock. But there was much nausea and vomiting for some days, and on March 31 the patient brought up some altered blood from the stomach; next day there was blood and mucus in the stool after a dose of castor-oil. At this period we had the advice of Sir Thomas Barlow in consultation. These symptoms were regarded as uræmic in origin. After the bowels were opened there was a profuse discharge of urine in the dressings, so that the functions of the kidneys were re-established. From this period onwards the patient made sure, though slow, progress towards recovery. Though the wound kept perfectly clean throughout, the temperature did not sink to normal for a fortnight, till, in fact, the septic poison that was absorbed before operation had been eliminated from the system.

On April 22, on inserting the nozzle of the irrigator in the suprapubic wound and filling the bladder, the lotion was passed *per urethram* in a continuous stream. On April 26, 8 ounces of urine were passed naturally. The wound was dry on May 1 and 2, and all urine was passed naturally; but it reopened on May 3. On May 7 a rubber catheter was tied in, and kept there till May 14, all urine being passed by this means.

The catheter was removed on May 14th, when the suprapubic wound was thoroughly healed, and all the urine subsequently was passed naturally. The patient continued in excellent health, able to pass and retain his urine as well as ever he did, and leading an extremely active life till December, 1907, when he contracted a chill, resulting in gastro-duodenal catarrh, to which he succumbed.

The prostate (Fig. 85), which weighs 2½ ounces, is symmetrically enlarged, each of the lateral lobes presenting a pedunculated outgrowth in the bladder the size of a cherry.

CASE 194.—Gentleman, aged eighty-seven, seen in consultation with

Dr. H. Roger Smith, Hampstead, May 31, 1905. Bladder symptoms for seven years. Stone crushed by another surgeon five years ago. Since then has had to use the catheter, at first once daily, gradually increasing in frequency till he now passes it six times daily. Passes a little urine naturally, accompanied by much pain and spasm. Urine alkaline, fetid, contains much pus and mucus. Has passed blood frequently. Patient's condition most distressing ; feels, as he says, that he can no longer go

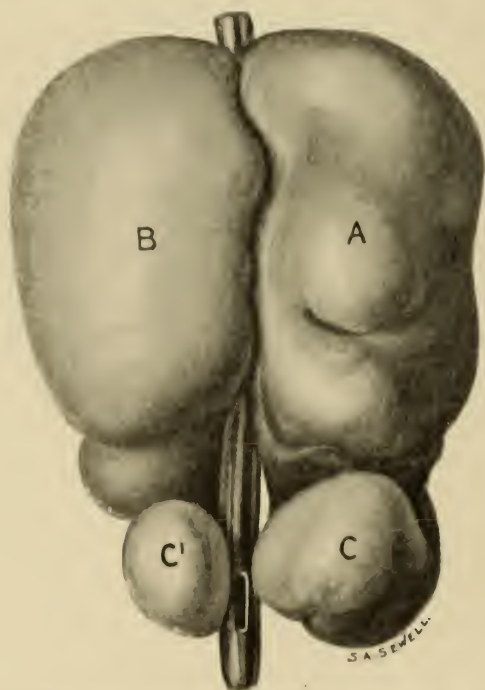


FIG. 85.—PROSTATE, WEIGHING 2 $\frac{3}{4}$ OUNCES, REMOVED FROM PATIENT AGED EIGHTY-TWO (CASE 174).

A, Right lobe ; B, left lobe ; C, C', pedunculated outgrowths in bladder.

on with the catheter. Prostate much enlarged *per rectum*, bilobed, soft, smooth, movable, felt bimanually. General health fair, but troubled with bronchial catarrh. Suffering from double inguinal hernia and double hydrocele.

On June 6, Mr. C. Braine being the anæsthetist, Mr. Thomson Walker and Dr. Roger Smith assisting, I enucleated the prostate entire in its capsule easily and rapidly. There was a small phosphatic stone, weigh-

ing 23 grains, found in the bladder. Time occupied, including removal of calculus, five minutes. The prostate was the size of a large Tangerine orange, almost symmetrical, and weighed 2 ounces. There was scarcely any bleeding, and no shock. The recovery was unaccompanied by any unfavourable symptoms, the temperature remaining practically normal

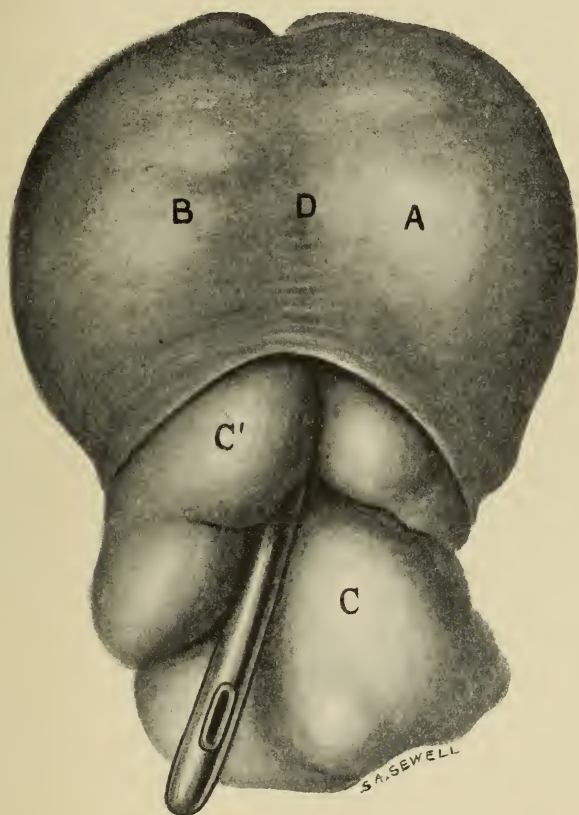


FIG. 86.—PROSTATE, WEIGHING $7\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED EIGHTY-FOUR (CASE 280).

B, A, Thin layer of sheath attached; D, placed over anterior commissure; C, C', outgrowths of lateral lobes in bladder.

throughout. In fact, the patient scarcely felt the operation in any way. He passed urine naturally June 20, and the wound was dry July 1.

After July 3 he sat up daily and walked about his room. The ease with which the operation was borne, and the rapidity of convalescence,

are extremely remarkable at this great age. On January 3, 1908, he wrote : ' My waterworks are in excellent working order, and have been so ever since I was under your care. Every time I pass water I feel grateful for the ease and comfort I now enjoy compared with the misery of my life when I put myself under your most skilful operation.'

CASE 280.—Gentleman, aged eighty-four, seen in consultation with Dr. P. L. Read, South Kensington, March 16, 1906. Prostatic symptoms dated from seventeen years ago, when he was advised by a surgeon to use a catheter. He dispensed with this till a year ago, when cystitis, accompanied by rigors and pyrexia, set in, and another surgeon was consulted. Catheter employed four or five times daily till three weeks previously, when he had to give it up owing to the pain and difficulty in its introduction. Condition very distressful : great frequency of micturition day and night ; bladder much distended. General health good. I passed a bicoudée catheter with difficulty and drew off 15 ounces residual urine, thick with pus and mucus. Prostate greatly enlarged, bilobed, dense, movable ; felt bimanually the size of a large orange.

On March 20, Dr. Read assisting, I enucleated the prostate (Fig. 86) entire, with a thin layer of the sheath adherent thereto, easily and rapidly, the time occupied being five minutes. The patient scarcely felt any inconvenience from the operation, and read the newspapers daily after the first day. Some urine passed naturally on April 8, and the wound was closed on April 11. He was sitting up out of bed on April 9, and went for a drive on April 15. Within four weeks from the date of operation he resumed business in the City, and is now in excellent health, untroubled by any urinary symptoms.

The prostate (Fig. 86) weighs $7\frac{1}{4}$ ounces. A thin layer of the sheath (B, A) came away with the prostate, being very adherent thereto. The letter D is placed over the line of the anterior commissure, marking the separation of the lateral lobes, which were continued as irregular projections (C, C') in the bladder, covered by the true capsule of the prostate.

CASE 355.—Gentleman, aged eighty-nine, seen with Dr. A. Grayling at Forest Hill, October 16, 1906. Prostatic symptoms had existed seven years, with almost complete retention on several occasions. Catheter introduced September 10, 1906, and 30 ounces urine drawn off. Severe cystitis since. Urine full of pus and very fetid. Patient in great agony and very feeble.

On October 16, Dr. Grayling assisting, I drained the bladder suprapubically with a view to relieve the cystitis and pressure on kidneys. By November 1 the patient had improved in health, though the pulse was still feeble, and nightly delirium existed. I enucleated the prostate, weighing $3\frac{1}{2}$ ounces, entire, in three minutes. On November 3 the patient was very low and refused food, but he rallied in a day or two.

Urine commenced to pass naturally November 19, and the wound was dry November 24. On December 10 he went home in good health, passing urine normally and retaining it for five or six hours. For the

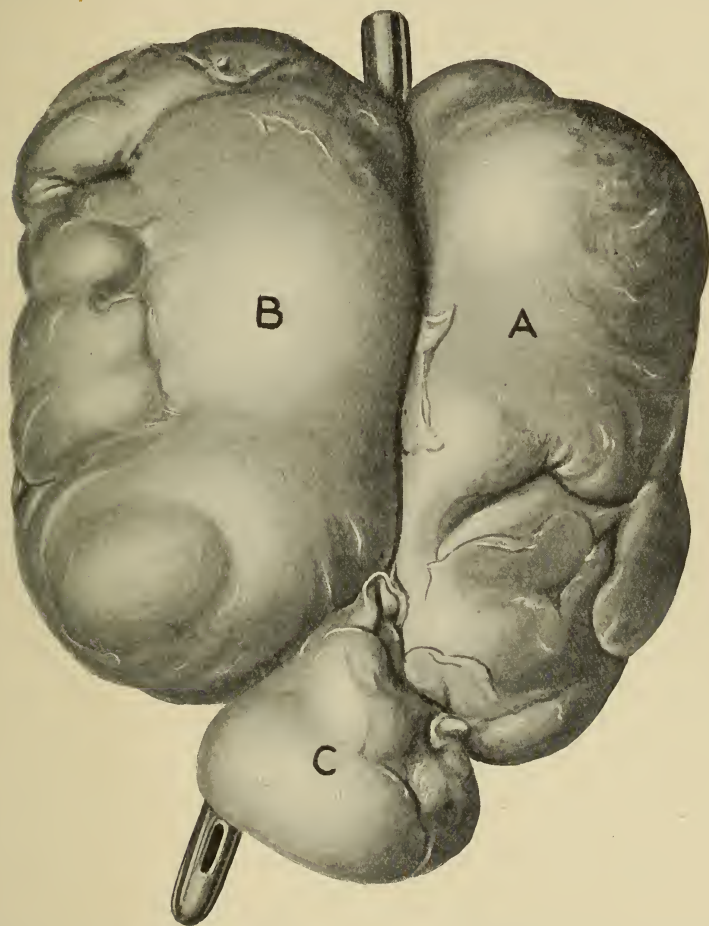


FIG. 87.—PROSTATE, WEIGHING $11\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED EIGHTY-ONE (CASE 420).

A, Right lobe with outgrowth, C, in bladder (so-called 'middle lobe'); B, left lobe.

last fortnight he had his secretary to work with him daily. On January 4, 1908, he writes: 'I am happy to say I am quite well in every respect.'

CASE 420.—Gentleman, aged eighty one, consulted me in February,

1906, for prostatic symptoms of five years' duration. Catheter employed for three months only, but great frequency of micturition; severe hæmorrhage on several occasions. Residual urine, 9 ounces, contained some pus. Prostate enormously enlarged, but soft and movable. Prostatectomy advised, but patient deferred operation till June last, when the symptoms became unbearable, and I saw him again through Dr. C. A. Kent, of Dover.

On June 13, 1907, Captain Steen, I.M.S., being present, I enucleated the prostate entire, but owing to its enormous size (Fig. 87) the lobes had to be severed to facilitate its delivery from the bladder. The operation lasted nine minutes; very little bleeding; no shock. Uninterrupted recovery, though wound slow in healing. All urine passed naturally after July 19. The patient is now in excellent health, and can retain and pass urine naturally as well as ever. On January 4, 1908, he writes: 'Water-works satisfactory; no trouble of any kind.' The prostate weighs 11½ ounces.

II.—ENUCLEATION OF THE WHOLE OR REMAINING PORTIONS OF THE PROSTATE IN CASES PREVIOUSLY SUBJECTED TO OPERATION BY OTHER METHODS.

Numerous instances have been recorded in detail, in my published lectures and papers, of patients suffering from enlarged prostate who had been previously subjected to operation by other methods unsuccessfully, but who were completely cured by my method of total enucleation of the organ, or of the portions left behind in cases of partial prostatectomy. A collection and arrangement of a few of these under their proper headings will prove both interesting and instructive.

1. Cases previously subjected to Castration.

CASE 43.—A gentleman, aged seventy-one, consulted me March 28, 1903, for prostatic troubles. Catheter employed for twenty years; not a drop of urine passed naturally for last eighteen years. Calculi removed by crushing on three occasions by London specialist; double castration by another London surgeon for cure of prostatic troubles in 1897, but without any amelioration of his symptoms. Slight paralytic stroke in

January, 1903, from which he completely recovered, but has had a nurse ever since. Extremely feeble and hysterical; breaks down and weeps without apparent cause. Patient's condition most pitiable. Hæmaturia from time to time. Urine contains much pus and blood, and is most offensive; bladder can retain only small quantity; hence catheter used half-hourly day and night. Enormous enlargement of prostate *per*

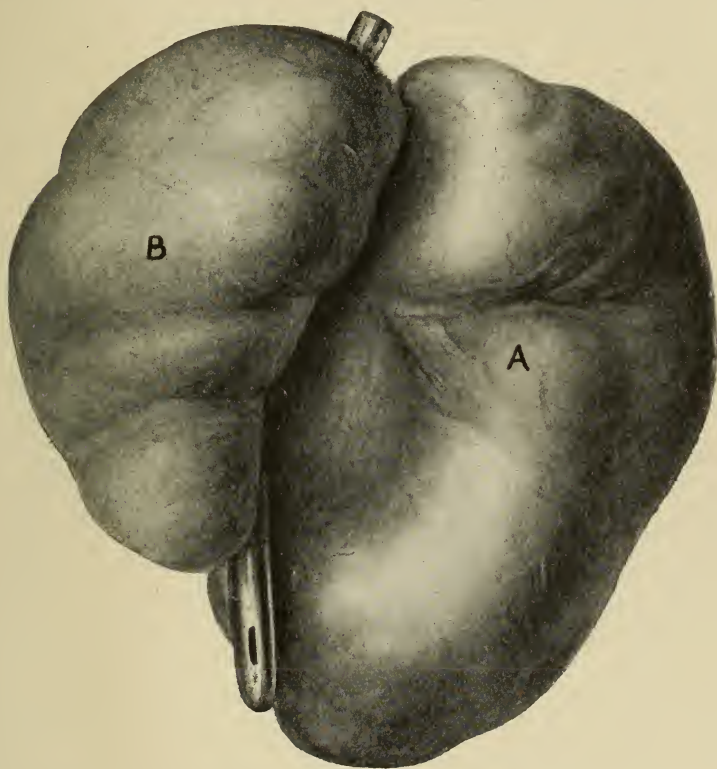


FIG. 88.—ENORMOUS PROSTATE, WEIGHING $8\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED SEVENTY-ONE (CASE 43).

A, Right lobe; B, left lobe. The transverse groove indicates the boundary between the intravesical and extravescical portions.

rectum, soft, smooth, bilobed, movable. Cystoscopy on March 30 revealed an enormous outgrowth of prostate in the bladder.

On April 1, Mr. Wylie assisting, I enucleated the prostate entire in its capsule. The prostate projected into the bladder in the form of a cone, the urethral oriſce being shaped like the crater of a volcano. Consider-

able force had to be employed to separate the capsule from the sheath. After delivery of the prostate as a whole into the bladder, owing to its large size, the lobes had to be separated to facilitate its removal, though it was very soft and spongy. Only eleven minutes elapsed from commencing the operation till the prostate was delivered from the bladder. There was scarcely any bleeding or shock. The patient made an uneventful recovery. Urine passed naturally April 26, and the wound was dry May 5. He was quite overcome with joy at passing urine naturally again after eighteen years of complete catheter life. Went home May 11, in excellent health, able to retain and pass his urine as well as ever he did. On March 14, 1906, nearly two years after operation, he writes: 'I am pleased to tell you that I pass urine quite freely, and retain it all right.'

The prostate (Fig. 88), which weighs $8\frac{1}{4}$ ounces, is a very large one. The right lobe (A) is enormously enlarged, the left lobe (B) less so. The case is, indeed, a remarkable one, showing what wonderful results may be accomplished by this operation even when the patient is almost moribund.

CASE 116.—Gentleman, aged sixty-two, came from Trinidad to consult me, on the advice of Dr. Eakin, Port of Spain, August 19, 1903. Prostatic symptoms eleven years. Double castration performed by a London surgeon in 1896 for cure of his disease, but with no benefit whatever. Completely dependent on the catheter six years; chronic cystitis; hæmorrhage twice. Prostate size of a walnut, hard, movable; scarcely felt bimanually, as patient was very stout. I advised removal of the prostate; but the operation was postponed for a year, owing to pressure of business. On his return, in July, 1904, patient was in much the same state; catheter used five or six times daily; urine 'fishy' in odour, contained much pus and mucus.

With the assistance of Mr. Thomson Walker I enucleated the prostate, weighing $1\frac{1}{4}$ ounces, entire in its capsule, July 21, easily and rapidly. Urine began to pass naturally August 4, but the suprapubic wound was slow in completely closing. I saw him on September 23, previous to his departure for Trinidad. He was in excellent health, the wound firmly closed, and he could pass and retain urine as well as he ever did.

2. Cases previously subjected to Vasectomy.

CASE 19.—An eminent physician, aged sixty-six, with prostatic symptoms for ten years; the whole of the urine passed by catheter for three years; also suffering from diabetes. On entering on catheter life suffered from glycosuric urethritis, which resulted in stricture, rendering catheterism painful and difficult. In November, 1899, I dilated the stricture under an anæsthetic, since which time a large metal sound had

been passed periodically to keep the canal open. Double vasectomy in February, 1900, with no benefit to the prostatic symptoms, though it prevented the recurrence of orchitis resulting from the use of the catheter. I had the advantage of the advice of several distinguished members of our profession in this case, including Sir Dyce Duckworth, Mr. Reginald Harrison, Drs. Gilbert Smith and R. Hutchinson. The patient's condition was most distressing, and during the past year he repeatedly suggested removal of the prostate, but I postponed compliance with his wish till the symptoms became unbearable. The dangers of an operation of this kind in the diabetic state were fully laid before him; but at the final consultation he stated that death would be preferable to his sufferings from catheter life, so I yielded to his appeal for operation. Cystoscopy on June 18; 'middle' lobe prominent in bladder. Prostate *per rectum* globular, tense, smooth, movable.

On July 17, 1902, Mr. C. Braine, anaesthetist, and Drs. Gilbert Smith and Hugh Playfair being present, I removed the prostate suprapubically. It was found impossible to separate the lobes along their anterior commissure, so the gland was removed as a whole with the prostatic urethra. There was very little shock, though there was considerable oozing of blood for twenty-four hours. Recovery without any unfavourable symptom, the temperature remaining practically normal, some urine passing naturally at the end of the first week, and the suprapubic wound being completely closed on August 7. He drove out daily from August 9, and travelled to Scotland August 14—twenty-eight days after operation. He continued in excellent health, able to pass and retain his urine quite naturally till April, 1903, when he sustained a stroke of paralysis from which he eventually died. On August 18, 1903, his wife wrote: 'What his helplessness would have meant, only for that operation, you and I alone know. His first words after his attack in Florence were, 'Thank God for my operation.'

Fig. 89 is the prostate, weighing 3 ounces. The so-called middle lobe (A) grows mainly from the left lobe (C). The whole is encircled by a thin fibrous and muscular band (D), part of the sheath formed by the recto-vesical fascia removed with the prostate. The lateral lobes (B, C) are seen covered by their true capsule.

I may say that this was one of the most anxious cases of my life, owing to the coexisting diabetes.

CASE 34.—Colonel M—, aged sixty-one, consulted me on January 9, 1903, on the advice of Dr. Guthrie Caley, Ealing. Prostatic symptoms for eleven years. Retention of urine in 1892; relieved by catheter by Dr. Simpson of Weymouth. Catheter employed continuously since then; urine passed entirely by catheter for last eight years. Frequent attacks of cystitis; passing blood since September, 1902. Vasectomy performed

in 1897 by a provincial surgeon: no improvement whatever therefrom. Prostate much enlarged *per rectum*, bilobed, soft, elastic, movable. Cystoscopy on January 14 revealed an enormous outgrowth of the right lobe, resembling a large tomato, in the bladder, and slight outgrowth of the left lobe. Patient went home and contracted influenza, some days after, which left him very feeble.

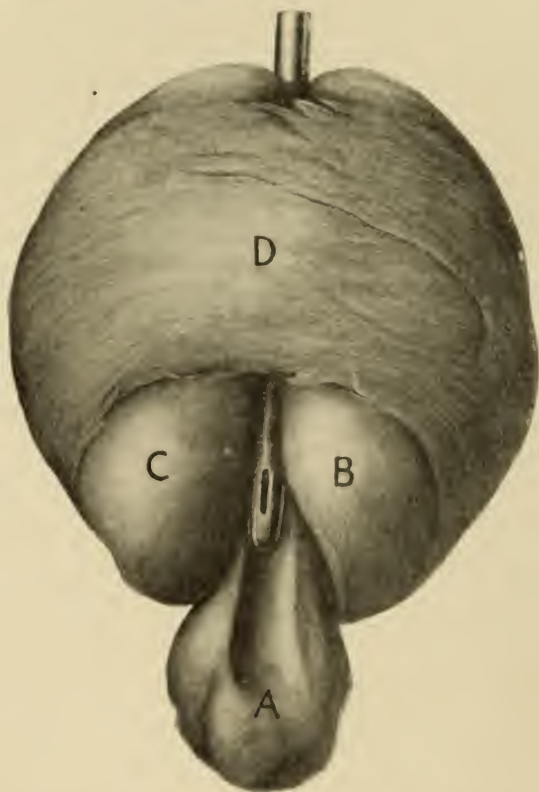


FIG. 89.—PROSTATE, WEIGHING 3 OUNCES, REMOVED FROM PATIENT AGED SIXTY-SIX (CASE 19).

A, 'Middle' lobe growing mainly from left lobe, C; D, fibro-muscular band from sheath removed with prostate, encircling lateral lobes, which are seen at C, B, covered by their true capsule.

He returned to London, and entered a surgical home on January 28, but was so feeble that I deferred operation. On February 11, Sir William Collins and Dr. A. Crombie being present, I removed the prostate easily

and rapidly, entire in its capsule, leaving the urethra behind uninjured. Some urine passed naturally February 25; wound closed March 3. Temperature normal throughout. Patient left for home in good health March 14, retaining and passing his urine as well as he ever did. On January 7, 1908, five years after operation, he wrote: 'I have been very well indeed, and have had no symptoms whatever of bladder

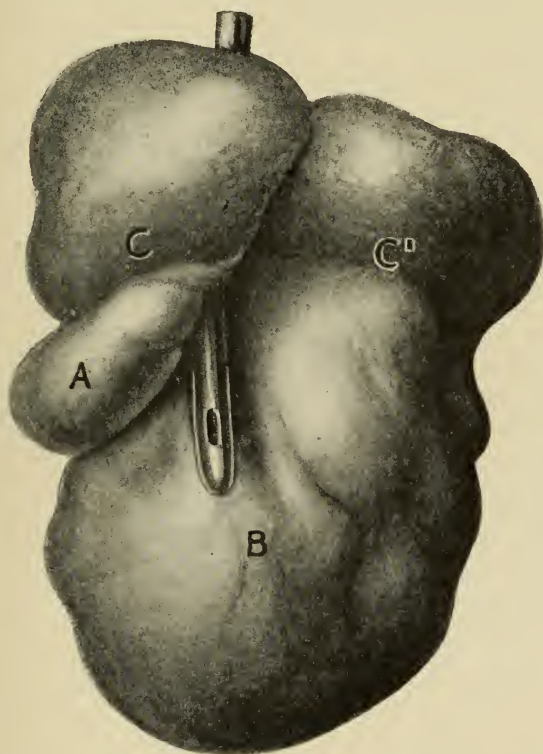


FIG. 90.—PROSTATE, WEIGHING $3\frac{3}{4}$ OUNCES, REMOVED FROM PATIENT AGED SIXTY-ONE (CASE 34).

B, Enormous outgrowth of right lobe in bladder; A, smaller growth of left; C, C', circular groove caused by constriction of recto-vesical fascia at neck of bladder.

trouble of any kind. A perfect and uninterrupted flow of water when necessary. February 11, the anniversary of the wonderful operation, is kept as a sort of second birthday.'

The prostate (Fig. 90), which weighs $3\frac{3}{4}$ ounces, is a remarkable speci-

men of unsymmetrical growth. Three-fourths of its bulk lay in the bladder, the right lobe being enormously enlarged in this direction, and the left only slightly so.

CASE 100.—Gentleman, aged sixty-eight, consulted me March 17, 1904, on the advice of Dr. F. Rodgers, Cambridge, and Dr. W. Woollcombe, Plymouth. Catheter employed for six years, entirely dependent thereon for two years. Double vasectomy by another surgeon in 1901, with no relief, but followed by orchitis. Prostate enlarged *per rectum*, movable; felt bimanually. Urine kept fairly clear by washing bladder daily, but contained pus. Operation arranged for, but subsequently postponed owing to severe attack of pneumonia.

On May 25 I removed the prostate entire in its capsule, Dr. Woollcombe assisting, Colonels J. Moorehead and J. Anderson, I.M.S., and Dr. Deighton, Cambridge, being present. Thumb-like outgrowth from left lobe acting as a ball-valve to the urethral orifice. Weight of prostate, $1\frac{1}{4}$ ounces: time occupied, five and a half minutes. Urine passed naturally June 7; wound dry June 11. On June 21 he left the surgical home able to pass and retain urine as well as ever he did. On January 5, 1908, he wrote: 'I am extraordinarily well. Waterworks all right; in fact, I have never got cause to think about them, whereas for long years before I never thought of anything else.'

3. Cases previously operated on by McGill's Method of Partial Prostatectomy.

CASE 48.—Gentleman, aged sixty-two, consulted me May 25, 1903, on the advice of Dr. Vickers, Wellington, Salop. Prostatic symptoms for ten years, with recurrent hæmorrhage during the last five. Profuse hæmorrhage on July 13, 1902, followed by retention of urine, which was relieved by catheter. The hæmorrhage recurring, and difficulty being experienced in introducing the catheter, on July 16 the bladder was opened suprapubically by a well-known provincial surgeon, who writes that he removed a 'middle lobe' lying over the inner orifice of the urethra, larger than a Tangerine orange. Owing to the weak condition of the patient, he did not consider it advisable to attempt total removal of the prostate. Convalescence was retarded by a large gluteal abscess, the suprapubic wound taking some three months to heal. After five weeks the wound again broke down, the fistula remaining continuously open ever since. Patient in a very miserable condition, passing urine every hour by day and night, almost entirely by the fistula. Much pain, with periodical discharge of large quantities of pus, 'as if an abscess had burst,' as the patient described it. General health very bad; numerous unhealthy sores all

over the body, due to absorption of septic matter. Prostate much enlarged *per rectum*, soft, tense, and more or less movable.

On June 2, Mr. C. Braine being the anæsthetist, I removed the remainder of the prostate, weighing $3\frac{1}{2}$ ounces. The operation was very prolonged ($1\frac{1}{4}$ hours). A very careful dissection was necessary to avoid opening the peritoneum, which was bound down to the scar. The hard scar tissue around the fistula rendered the abdominal wall unyielding, so that the finger with great difficulty reached the prostate. And, finally, the prostate itself was matted with the bladder walls and the enveloping sheath, so that great difficulty was experienced in its enucleation; indeed, it was removed in four separate pieces. There was, however, little bleeding, though the shock was severe and lasted for some hours.

With the exception of a bilious attack a week after operation, the patient made an uninterrupted recovery. He passed some urine naturally June 16, and the suprapubic wound was quite closed June 23. On July 12 he left for the seaside in excellent health, retaining and passing his urine naturally. On April 5, 1904, he wrote: 'I am still going on well, and am in excellent health,' in which state he remained till a short time before his death on November 23, 1905, from an abdominal operation. A relative wrote me on December 3, 1905: 'It (his death) had nothing to do with the old trouble at all; he had a twist in the bowel.'

This case presents a practical example of the unsatisfactory results attendant on McGill's operation, or partial prostatectomy; also of the difficulties that may be encountered in attempting subsequent removal of the main portion of the prostate which is left behind.

CASE 63.—On October 20, 1903, I was summoned to Birmingham to see, in consultation with Dr. M. Hallwright, a gentleman, aged sixty-six, who had suffered from prostatic symptoms for seven years, extremely distressing for the last three. Early in 1903 he became suddenly much worse, and a catheter was passed by a surgeon. This was followed by much constitutional disturbance and pyrexia, in consequence of which the catheter was not persisted in. In February he had continued pain, constant spasm with offensive urine. The physician then in charge found tube casts, and considered that pyelitis had set in. Complete retention on March 1, for which the bladder was opened suprapubically by a well-known surgeon, and a prominent portion of the prostate in the bladder, weighing $\frac{3}{4}$ ounce, removed. Although relieved to some extent, patient was never free from bladder spasm, though suprapubic drainage was kept up, and after some months he drove out, wearing a urinal. No urine had passed naturally since the operation. Orchitis also supervened, and the straining and discomfort of the urinary apparatus

became so wearing that complete removal of the prostate was contemplated. It was with this view that I was called in. I found the prostate considerably enlarged *per rectum*, bilobed, elastic, and movable, and I considered it one capable of being removed. The patient was of a nervous temperament, extremely thin and worn from his constant sufferings, but wiry.

For various reasons it was considered inadvisable to bring the patient to London, so on October 24 I operated at Birmingham—Dr. Haynes, anæsthetist, Dr. Hallwright assisting, and Dr. C. Nichols being present. Having opened up and enlarged the suprapubic fistula, I found the right lobe of the prostate somewhat prominent in the bladder, and the enucleation of this portion was quite easy. The left lobe, however, was matted by cicatricial tissue with the bladder, the result of the previous operation, and the enucleation of this portion was effected with considerable difficulty, much force being necessary to separate it from the surrounding tissues. Eventually the prostate, or, rather, what remained of it from the previous operation, came away in one mass, weighing $1\frac{1}{2}$ ounces. There was little bleeding or shock. I saw the patient with Dr. Hallwright several times during the ensuing three weeks. He continued to make favourable progress, though he had several rises of temperature. On November 15 patient passed $3\frac{1}{2}$ ounces of urine naturally, and on November 22 the wound was completely closed. On December 6 Dr. Hallwright wrote: 'The patient is better than he has been for years, and gains strength daily. He says the water is beautiful and takes no time in passing.' I have to acknowledge the devotion and skill with which the after-treatment was carried out by Dr. Hallwright, and which largely contributed to the successful result.

This gentleman is now in excellent health, at the head of a great business. On December 20, 1907, he wrote: 'The splendid operation, attended with such gratifying results, is still of permanent benefit.'

CASE 72.—H. P——, aged fifty-nine, admitted to St. Peter's Hospital December 5, 1903, with the usual symptoms of enlarged prostate. This patient had been operated on by another surgeon in April, 1901, by McGill's method, an enlarged 'middle lobe' of the prostate being removed. The suprapubic wound did not heal till January, 1902, when the sinus was excised and cauterized. Since then, increasing pain and frequency of micturition. Catheter passed nightly, after which he got five or six hours' sleep; at other times had to urinate every two hours. Residual urine, 8 ounces, alkaline, fetid, contained much pus. Prostate enlarged *per rectum*; rounded, tense; fairly movable. Cystoscopy on December 9, 1903, showed the prostate enlarged and rounded on the left side, irregularly jagged on the right. A mass of the muco-pus covered the trigone, and in this was embedded a phosphatic calculus, which was

removed by litholapaxy. The bladder was washed out daily, with the result that the urine became acid, but there was no diminution in the pus or frequency.

On December 16, Mr. Bickersteth of Liverpool and others being present, I removed the prostate. There was considerable difficulty in opening the bladder suprapubically, owing to the scar tissues being matted together, and still greater difficulty in enucleating the prostate, owing to the inflammatory adhesions, resulting from the previous operation, between the inner margins of the prostate and the walls of the bladder, though the gland came away readily from the triangular ligament. A portion of the prostatic urethra came away adherent to the gland. Uninterrupted recovery. The wound was closed December 29, thirteen

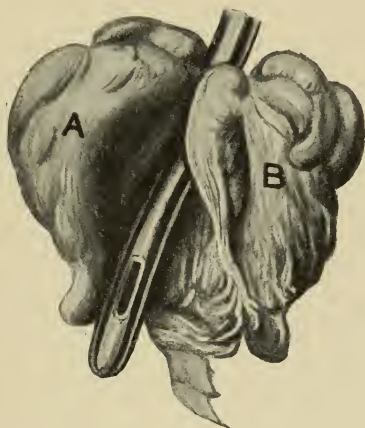


FIG. 91.—PROSTATE, WEIGHING $1\frac{1}{4}$ OUNCES, REMOVED FROM PATIENT AGED FIFTY-NINE (CASE 72).

A, Smooth nodular left lobe ; B, jagged right lobe, result of portion having been previously removed by McGill's operation.

days after the operation. The patient is now quite well, able to retain and pass his urine as well as he ever did.

The prostate (Fig. 91), which weighs $1\frac{1}{4}$ ounces, is jagged along the posterior aspect of the right lobe, where it was adherent to and matted with the bladder wall.

This is the third case in which my operation of complete enucleation of the prostate has been entirely successful after McGill's operation had failed. The previous operator in this case has persistently in his writings, and otherwise, minimized and misrepresented the nature and scope of my operation, as being identical with McGill's. It is the irony of fate that

this case, in which McGill's operation performed by him had entirely failed to bring relief to the patient, should have fallen into my hands to be completely cured by total extirpation of the prostate.

4. Case previously subjected to Perineal Prostatectomy.

CASE 199.—Gentleman, aged sixty-three, seen in consultation with Dr. D. W. Patterson (Newcastle-on-Tyne), March 1, 1904. Prostatic symptoms for ten years. Residual urine, $4\frac{1}{2}$ ounces; prostate much enlarged *per rectum*, particularly the right lobe, soft, smooth, movable, and felt bimanually. The case was considered a most favourable one for removal of the prostate, which was advised. Other counsels, however, prevailed. Acute retention set in in July, followed by severe cystitis. Perineal prostatectomy was performed by another surgeon in September, 1904. Patient apparently did well till the perineal wound healed, when there was great difficulty in micturition from stricture, which, however, yielded to dilatation. Since that time he had not been able to empty his bladder, the residual urine varying from 4 to 14 ounces. Bladder emptied by catheter and washed out daily for months, as the urine contained much muco-pus.

I saw the patient again with Dr. Patterson, June 26, 1905. I drew off 10 ounces residual urine, containing much pus and mucus. I could find no trace of the prostate *per rectum*, but on bimanual examination I felt a lump the size of a walnut in the median line at the neck of the bladder, which was regarded as a portion of the prostate left behind.

On June 29, Mr. C. Braine being anaesthetist, I opened the bladder suprapubically. The inner orifice of the urethra was found stenosed and surrounded by a beaded prostatic collar, from the base of which a teat-like process projected into the bladder. This collar was forcibly burst open by the finger, and the remaining prostatic substance scraped out of the sheath by the finger-nail. This was a slow procedure, as, though the collar presenting in the bladder was easily detached from the mucous membrane, the anterior portions of the prostatic tissue were stoutly adherent to the sheath from cicatricial union, the result of the perineal prostatectomy. The remaining portion of the prostate came away piecemeal, and weighed $\frac{1}{2}$ ounce. After its removal the sheath felt quite smooth, and the neck of the bladder gaped widely open. There was much more bleeding than in an ordinary case of enucleation of the prostate entire.

Recovery, though rather slow, was uninterrupted. Some urine was passed *per urethram* on July 15, and wholly in this way on July 24. On January 4, 1908, he writes: 'The operation performed by you in June, 1906, has remained a perfect success. I can retain and expel the contents

of the bladder at discretion. The result is the more remarkable because before coming to you I had been the victim of a failure on the part of another surgeon, whose operation of September, 1904, had been absolutely valueless, causing me to fear that no successful result was possible.'

5. Case previously subjected to Bottini's Operation.

CASE 120.—A distinguished Russian General, aged seventy-five, consulted me August 4, 1904, suffering from prostatic symptoms for six years; completely dependent on the catheter for three years; operated on about three years ago by the late Professor Bottini of Italy by the electro-cautery, but with no improvement. Since then has had cystitis continuously, for which bladder washed out twice daily. Had consulted many specialists on the Continent and in England, including Professor Guyon of Paris, with whose kind approval I was approached with a view to removal of the prostate. Great loss of flesh during past few years, with some digestive troubles; prostate enlarged *per rectum*, bilobed, very movable, felt bimanually; calculus detected by the sound; sufferings so severe that the patient said he would run any risk from operation rather than continue 'catheter life.' On my advice he consulted Sir Douglas Powell, who considered that his constitution was sufficiently sound to stand operation, which had to be postponed till after my autumn holiday.

On September 15, Dr. Hewitt being the anæsthetist, I removed two phosphatic calculi suprapubically, and then enucleated the prostate. This was accomplished with difficulty, owing to the cicatricial adhesions between the prostate and bladder resulting from Bottini's operation. Scarcely any bleeding; no shock. There was no rise of temperature, and satisfactory progress was made, with the exception of his severe digestive troubles, for which Sir William Broadbent saw him with me. On September 24 urine passed freely *per urethram*, but the suprapubic wound being slow in closing, I tied in a rubber catheter on October 21 for five days, when the suprapubic wound was firmly closed, and the urine passed naturally with perfect ease. On November 5 patient left for the Riviera in good health, able to pass and retain his urine better than he ever did before. On January 16, 1905, I heard from him that his urine was quite clear, and that his digestive troubles had practically disappeared.

LECTURE XI

RESULTS OF THE OPERATION OF TOTAL ENUCLEATION OF THE PROSTATE, WITH SOME CONCLUDING REMARKS

EXCLUDING undoubted instances of carcinoma, I have now performed my operation of total enucleation of the adenomatous prostate in 481 cases, the patients varying in age from forty-nine to eighty-nine years, the average age being sixty-eight years; and the prostates weighing from $\frac{1}{2}$ ounce to $14\frac{1}{4}$ ounces, with an average weight of $2\frac{3}{4}$ ounces.

The vast majority of the patients had been entirely dependent on the catheter for periods varying up to twenty-four years. Nearly all of them were in broken health, and many were apparently moribund when the operation was undertaken. The great majority of them were, indeed, reduced to such a wretched condition that existence was simply unendurable. Few of them were free from one or more grave complications, such as cystitis, stone in the bladder, pyelitis, kidney disease, diabetes, heart disease, thoracic aneurism, chronic bronchitis, paralysis, single, double, or even treble hernia, hæmorrhoids, and in a few instances cancer of some other organ than the prostate. Such, then, were the unpromising conditions under which the operation was undertaken.

In connexion with these 481 operations there were 32 deaths, the remaining 449 cases being successful. And

when I speak of success I mean complete success, the patients regaining the power of retaining and passing urine naturally without the aid of a catheter as well as they ever did. There are no half-measures about this operation. The patient can be assured beforehand that if he is prepared to accept the comparatively small risk attaching thereto, he can, with absolute certainty, look forward to a complete cure. In no instance has the patient failed to regain the power of voluntary micturition without the aid of a catheter. There has been no instance of relapse of the symptoms; on the contrary, lapse of time only seems to consolidate the cure. In no case has there been contraction at the seat of operation leading to organic stricture; nor has there been any instance of a permanent fistula remaining. In very few instances have distinct symptoms of septicæmia supervened.

Considering that in nearly the whole of the cases the urine was septic, and in many putrid, before the operation, this comparative absence of septicæmia is remarkable. To what are we to attribute this immunity? No matter how carefully the bladder is irrigated, it is quite impossible to keep the wound thoroughly aseptic. It must be remembered that a very large proportion of aged men succumb to septicæmia on entering on what is commonly termed 'catheter life.' Probably those that survive become more or less immune by gradual absorption of toxins from the septic urine that prevails sooner or later in all cases of habitual employment of the catheter.

The causes of death are as follows:

(a) Thirteen cases from uræmic symptoms, at intervals varying from two to thirty-nine days after operation. In all of these cases the patients were suffering from pyelo-nephritis, or other chronic disease of the kidneys, resulting from the prostatic obstruction.

(b) Six from heart failure—namely, two a few hours after operation, the patients, aged seventy-six and eighty-five years respectively, having been worn out by the intense suffering of many years; two eleven days after operation, suddenly, after having progressed most satisfactorily, the autopsy revealing aortic and heart disease in one; one twelve days after operation, the necropsy revealing aortic incompetency and interstitial nephritis; and one, aged eighty-six, on the third day, whose case was complicated by cancer of the bladder.

(c) Two from septicæmia, thirteen and thirty-five days respectively, after operation, the necropsy revealing extensive interstitial nephritis in the latter.

(d) Two from mania, after the wounds had practically healed, the mania in one instance being hereditary, and having set in before operation.

(e) Two from liver disease, believed to be malignant, fifteen and nineteen days respectively, after operation. One was complicated by a large vesical calculus, cystitis, and pyelitis. The other was deeply jaundiced at the time of operation, which was undertaken as almost a forlorn hope to relieve terrible suffering (the prostate was found to be of a dark yellow colour from the bile-pigment). Both had for two years suffered from gastro-hepatic symptoms.

(f) Two from shock seven and twenty-four hours after operation.

(g) One from exhaustion thirty-three days after operation, the kidneys being extensively diseased.

(h) One from heat-stroke, on the tenth day, when quite convalescent from the operation.

(i) One from pneumonia seven days after operation. Two days before operation the patient had travelled a long journey in snowy weather, and it is believed that the pneumonia was the result of a chill thus contracted.

(j) One from acute bronchitis thirty hours after operation.

This patient was suffering from an enormous naso-pharyngeal growth, the removal of which had been twice attempted. The bronchitis was attributed to the anæsthetic acting on an irritable mucous membrane.

(*k*) One suddenly on the fifth day after pulmonary embolism. I saw the patient an hour before death, and he had had no unfavourable symptom since the operation.

Though these deaths are recorded in connexion with the operation, it will be observed that in not more than one half of the number can the fatal result be attributed directly thereto, the remaining deaths being due to diseases incident to old age. This operation is comparable to none other in surgery, owing to the advanced age to which it is necessarily confined, and the broken-down constitutions of the patients from prolonged suffering; and in judging of the mortality connected therewith we must not lose sight of the fact that during the period of after-treatment and convalescence men of this age are peculiarly liable to be carried off suddenly by disease entirely unconnected with the operation, the occurrence, however, vitiating the results from a statistical point of view.

But even if we accept all the deaths in connexion with the operation, this would give only a mortality of 6·65 per cent., which is much less than the mortality from lithotomy in all ages combined ($12\frac{1}{2}$ per cent. according to statistics collected by Sir Henry Thompson), and about one-fifth of the mortality from lithotomy in the corresponding ages ($33\frac{1}{2}$ per cent. according to Sir Henry Thompson). If the operation were undertaken in selected cases only—cases in which the general health was unimpaired—the mortality might be still further much reduced; but any such restriction is in my opinion unjustifiable, as it would have the effect of excluding five-sixths of the patients who at present seek relief from this operation. As the operation becomes more

widely known and more popular, patients will no doubt seek relief therefrom at an earlier period of the disease, whilst their constitutions are sound, and, above all, the kidneys unimpaired, with a much greater prospect of success. It will be observed that in a large proportion of the fatal cases death was due to chronic forms of kidney disease incident to so-called 'catheter life.' It therefore behoves the patient to seek, and it is incumbent on his medical adviser to urge, operation whilst the kidneys are still sound, before the complications arising from 'catheter life' set in, resulting in destruction of the kidneys, or impairment of their functions. Increased experience and dexterity in operating, improvement in the details of the after-treatment, and a greater perfection in the nursing are all factors that will undoubtedly tend to reduce still further the death-rate. I have recently had a consecutive series of forty-one operations without a death.

I submit that the results of this operation—so subversive of all preconceived ideas regarding the enlarged prostate, so revolutionary in its effects, so complete and permanent in its cure—are truly remarkable. They are far beyond anything I could have hoped for at its inception. I believe that I shall not be accused of exaggeration when I state that all previous so-called methods of radical cure of enlarged prostate were utterly unsatisfactory, and that catheterism, though hitherto the least objectionable mode of treatment in the majority of cases, is certain sooner or later to terminate in cystitis and other dangerous complications. The successful results obtained in this large series of cases of total enucleation of the enlarged prostate encourage us in the hope that we have at last arrived at a rational and practical method of dealing with one of the most painful, pathetic, and fatal diseases.

There is, perhaps, no expression which one hears and sees more constantly made use of in connexion with prostatic

cases than 'atony of the bladder.' The history of these cases goes far to prove, I submit, that no such condition exists, even in the most advanced instances of the disease ; and that even when complete catheterism has prevailed for many years the bladder walls retain their expulsive power. Indeed, they are constantly making involuntary efforts to get rid of the urine, which is merely kept back by the mechanical blockage of the passage by the enlarged prostate. And though in the early stages of the disease a so-called 'middle lobe' may impede the flow, I am convinced that in the later stages the lateral pressure exerted on the canal is the main cause of the obstruction.

One of the most remarkable features of this operation is the complete restoration of the power of voluntary micturition after habitual catheterism had been employed for lengthened periods. It may be of interest to quote the opinions of two eminent surgeons, one in this country and one on the Continent, as to the possibility of this occurring. The late Sir H. Thompson, in the last edition of his 'Diseases of the Urinary Organs,' writes :

'When it has been necessary to practise habitual catheterism for retention from enlarged prostate during a period of one or two years, the coats of the bladder lose their power and are incapable, I believe, of regaining it in almost any case after that lapse of time, and would fail to expel their contents even supposing the obstruction to be entirely removed. There is good ground for believing that no operation would restore a *status quo*, on account of our inability to restore the expelling function to a bladder which has long ceased to exercise it.'

And M. Guyon in his 'Leçons Cliniques' (1888) writes :

'Voyez, en avant, ces lourdes masses qui représentent les lobes latéraux, fortement appliqués l'un contre l'autre et qui opposent un obstacle certainement plus considérable que le

lobe moyen à l'écoulement de l'urine. *Croyez-vous qu'il soit jamais possible d'en pratiquer aussi l'ablation ? Et quand un tel prodige opératoire deviendrait réalisable, croyez-vous que la vessie, après avoir été plus ou moins longtemps soumise à la distension, pourrait recouvrer son intégrité anatomique et fonctionnelle ? Croyez-vous que les lésions histologiques dont sa couche musculaire et sa muqueuse sont atteintes, et celles qui portent sur la substance rénale, seraient aussi susceptibles de rétrograder ? Il est évident que toutes ces lésions, et vous savez qu'elles sont à peu près constantes, mêmes dès le début de la maladie, ne peuvent relever d'aucune intervention opératoire, et je puis ainsi conclure que le traitement radical de l'hypertrophie de la prostate n'existe pas et ne saurait exister.'*

The italics are mine. The very decided opinions expressed by these two distinguished surgeons—opinions based on purely theoretical grounds—have, happily, been entirely falsified by the results of these cases; for not only has the enlarged prostate been ablated in each instance, but the expulsive power of the bladder has been completely restored after that power had been lost for periods varying from a few months to twenty-four years. It was, therefore, a source of much pleasure and satisfaction to me to receive from Sir Henry Thompson a letter intimating his conversion to my views in the following words:

'I am much obliged to you for sending me your lecture, and cannot resist the evidence you have produced that the operation of total extirpation of the prostate is possible, and has led to excellent results.

'I am surprised by the results which you have found in your cases, of power to empty the bladder by the natural powers, which were not believed on *a priori* grounds by my old friend Guyon and myself to exist.'

Sir Henry, who was intensely interested in this operation,

was good enough to pay me several visits for the purpose of examining the prostates removed, and I was fortunate in having the aid of this veteran surgeon in the interpretation of certain features connected therewith.

The essential portion of the operation—that during which profound anæsthesia is necessary—is covered by the time that elapses between commencing the suprapubic cystotomy and the delivery of the prostate from the bladder. It will have been observed that with increased experience has come increased rapidity of execution. In the early days of the operation it was not unusual for this period to extend to twenty minutes or half an hour, or even more, whilst latterly in ordinary cases this period is covered by from two to five minutes, and in difficult cases by from eight to twelve minutes. There can be no doubt that rapidity in operating is of vital importance in an operation of this kind, confined as it is to persons of advanced age, thus shortening the period during which full anæsthesia is necessary, minimizing the loss of blood, and obviating shock.

In the correspondence that ensued on the publication of my first lecture on the subject of total enucleation of the prostate in the *British Medical Journal* of July 21, 1901, the question was discussed as to whether, as held by me, my operation was a complete prostatectomy, or, as suggested by some, one in which a thin layer of the outer rim of the prostate was left behind. The question was, of course, one of purely academic interest, and could not in any way detract from the practical merits of the operation, for no one could deny that the results were eminently satisfactory to the patient.

The evidence on which I based my conclusion that my operation was a complete prostatectomy may be summarized thus: (1) The general conformation of the specimens removed by me indicated that they were entire prostates.

(2) The absence of any palpable prostatic substance in the cavity that remained at the time of operation, as felt between a finger in this cavity and a finger in the rectum—a very thin membrane, consisting merely of the bowel and the sheath of recto-vesical fascia, lying between the points of the fingers. (3) The absence of any mass resembling prostatic tissue in the cases operated on, at any period after the operation, on examination by the finger in the rectum. (4) When the enlarged prostate projects prominently in the bladder the true capsule is at once reached on scraping through the mucous membrane covering it by the finger-nail. Following the outer aspect of this capsule by pushing the finger through the lumen, outside the bladder, in the plane between it and the sheath, the organ is enucleated in its capsule. Now, if a layer of prostate were left behind extravesically, this layer must necessarily extend intravesically; but in practice no such layer is found in the bladder, but merely mucous membrane. (5) The absolute and complete relief of the symptoms after operation, no matter how many years the patient had been dependent on the catheter. (6) But Mr. Thomson Walker has adduced the most cogent evidence of all (*vide* Medico-Chirurgical Transactions, 1904, pp. 404-445), by demonstrating that no prostatic tissue is found in specimens removed from the bodies of persons on whom the operation had been performed during life. The fact that occasionally a minute nodule or tuft of prostatic tissue is accidentally left behind, owing probably to inflammatory adhesions between the capsule and sheath, is no proof that the prostate is not enucleable as a whole. As well might it be argued that the edible portion of an orange is not enucleable entire from the rind, because occasionally, through under- or over-ripeness, a small mass of the pulp and capsule is left adherent to the rind.

LECTURE XII

TUMOURS OF THE BLADDER

TUMOURS of the bladder may occur either as *primary* or *secondary* growths. The former alone are of practical importance to the surgeon, and in the following remarks I shall deal exclusively with them.

Tumours of the bladder, like tumours in any other region of the body, may be classified most conveniently according to the tissue from which they have their origin or of which they are composed: (1) epithelial tumours; (2) connective-tissue tumours; (3) dermoids; and (4) cysts. Those of the latter two groups are rarely found in the bladder, and require merely passing notice. New growths of the first group are those most frequently encountered, and they demand particular attention. Of these, the most important—as most common and most amenable to treatment—is the papilloma, of which there are two typical forms: (1) villous papilloma, and (2) fibro-papilloma.

Papillomata of the bladder have their origin apparently in an overgrowth of the normal mucous membrane, and are analogous to the cutaneous warts. The type of papilloma most frequently met with is the pedunculated ‘villous papilloma’ (Figs. 92, 93, 94, and 95), which consist of a fleshy mass, varying generally in size from that of a cherry to that of a walnut, attached to the bladder wall by means of a

pedicle, and covered partially or wholly by villous processes or papillæ, from which the tumour derives its designation.

If we immerse a typical specimen of this kind in water immediately after removal, and examine it, we find that the pedicle terminates in an expansion named the 'core' or 'framework,' which is clothed by villi projecting from its surface, and giving the whole a shaggy, flocculent appearance



FIG. 92.

of greyish-white colour. If we then lift it out of the water and examine it in air, we find that the villous processes have collapsed and adhere, the tumour resembling a mass of wet grey velvet or a miniature deck-mop.

Viewed through the cystoscope in the bladder before removal, the villi or fimbriæ, when long, influenced by the artificial currents set up by the movements of the instrument, are seen to wave about in the fluid, the growth as a

whole presenting a bright pink appearance, of rare beauty sometimes, due to the blood circulating in the villi being visible through the almost translucent structure. Occasionally hæmorrhagic spots, or even ulcers, may be seen, the result of contusions.

Directing attention now to the component parts of a papillomatous growth, we find that the pedicle may be either cylindrical or somewhat flattened. It varies in length, as a rule, from $\frac{1}{4}$ to 1 inch, but occasionally attains to several inches. It varies in thickness from that of a slender thread to that of a cedar lead-pencil, the very fine variety

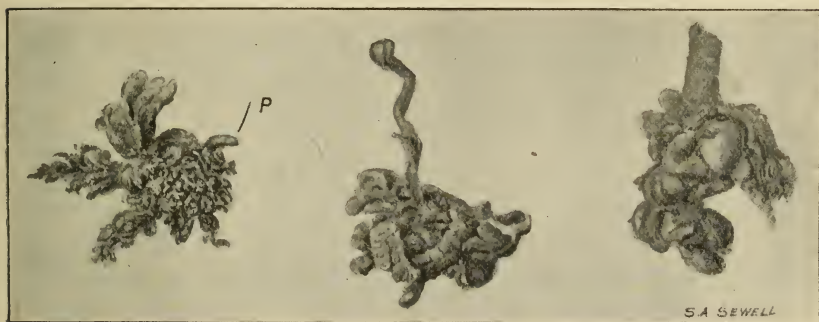


FIG. 93.

FIG. 94.

FIG. 95.

being rare. This pedicle is composed mainly of connective tissue, interspersed with which are found unstriped muscular and elastic fibres derived from the submucosa, the surface being covered by epithelial cells similar to those found in the bladder. Vessels and nerves pass through its axis. The pedicle is attached to the mucous covering of the bladder alone, and when pulled on the latter is raised off the muscular coat in pyramidal fashion. There is no infiltration of the adjacent mucous membrane or submucous tissue—a point of vital importance in distinguishing this growth from those of a malignant type.

The structure of the core, or body of the tumour, is similar to that of the pedicle, of which it is, indeed, merely an expansion. Frequently the framework is merely a prolongation of the pedicle, covered with tufts of villi; and occasionally there is little or no body, the tufts of villi springing directly from the end of the pedicle, the whole resembling a pollard tree. The body, again, may be lobulated, composed of several distinct, more or less rounded masses, each covered by short, thick-set villi, the whole presenting a cauliflower-like appearance. Indeed, innumerable varieties of this tumour, as regards shape, number, and attachment of the villi, are found.

The villosities covering the surface of the growth vary much in length and shape. Some are so short as to be recognisable only by a hand lens. These short, thick, compactly set villi may give the tumour a velvety appearance. Other long and slender fimbriæ may reach a length of 1 or 2 inches, and are more sparsely arranged. Between these extremities all varieties of villi are found. They may spring from the tumour as simple, thread-like cylinders, or as miniature flattened blades of grass. Some bifurcate, others digitate, or they may branch and rebranch like a tree. Portions of the surface of the tumour may be devoid of villi, giving it a bald appearance in patches. Hæmorrhagic spots or ulcers may be present from traumatism, and deposits of phosphates may take place on its surface, particularly on, and in the vicinity of, the ulcers. Microscopically an individual villus is found to be composed of delicate connective tissue, covered by layers of columnar epithelial cells, and traversed by a capillary loop of bloodvessel. Isolated fibres of unstriped muscle, continued from the core, are sometimes found entering the base of the villus for a short distance.

When a tumour is attached to the bladder-wall by means of a pedicle it is termed 'pedunculated,' and this is the most

common variety. It may, however, spring from the mucous membrane by a broad base, without the intervention of a pedicle, when it is termed 'sessile.' If the base or attachment of the tumour be contracted, forming a neck, the term 'subsessile' is applied. Sometimes the simple villi spring directly from the mucous covering of the bladder, either in clumps or scattered broadcast over an extensive surface, without the intervention of any body or core—a condition which may be described as 'diffuse' papilloma. When the villi are arranged on ridges or crests of mucous membrane, the term 'coronoid' is sometimes employed.

Though papillomata may arise from any portion of the mucous membrane of the bladder, except, perhaps, the trigone, they are most frequently found in the vicinity of the ureteral openings. In my own practice I have found them most commonly attached to the bladder wall to the outside and in front of the ureteral orifices. Instances of benign papillomata growing solely from the trigone are extremely rare, if ever found. I have not met with an instance of this kind in my own practice. But springing from the mucous membrane close to the trigone, the base of the tumour not infrequently encroaches by growth on that area. The exemption of the trigone from growths of this nature is attributed to the fact that the mucous membrane of this area is firmly bound down to the subjacent muscular coat without the intervention of any loose areolar tissue. Laxity of the mucous membrane seems to be essential to the development of these soft villous tumours. Papillomata spring occasionally, though rarely, from the margins of the inner orifice of the urethra.

Papillomata, whether sessile or pedunculated, vary in size from that of a pea to an enormous mass almost filling the bladder. The largest which I have removed was of the size of an orange, and was attached to the outer edge of the left

ureteral orifice by a pedicle 1 inch long and as thick as a goose-quill. This was in a patient sent by Dr. J. W. Erskine, of Chelsea, who was present at the operation in June, 1897. The symptoms, which were not severe, had existed for only two years. On the other hand, a papilloma may be of extremely slow growth, and, though small in size, may give rise to very grave symptoms. One June 20, 1899, I removed a pedunculated papilloma of the size of a cherry (Fig. 94) from a patient, aged thirty-six years, sent by Dr. J. J. C. Constable, of Kennington Park. This gentleman had suffered from hæmaturia for eighteen years, and at the time of operation was extremely anæmic from constant loss of blood. There has been no recurrence, and the patient is now in sound health.

Papillomatous tumours occur singly in the vast majority of cases. When multiple the number, as a rule, does not exceed three or four. Occasionally numerous growths are found scattered over the surface of the bladder. In cases of multiple growth there is generally a largish tumour with one or more subsidiary growths. It has been suggested—without any tangible proof, however—that the subsidiary growths are derived as seedlings from the main growth.

There are instances on record of spontaneous detachment of a pedunculated papilloma. This accident probably occurs through spasmodic contraction of the bladder on the tumour, thus rupturing the pedicle, or through twisting of the pedicle on itself, giving rise to strangulation and death of the tumour, owing to the cutting off of the blood-supply. Papilloma is most frequently found between the ages of twenty-five and fifty years, though it may occur in childhood or in old age. Males are more frequently affected than females.

A pedunculated growth may from time to time be carried during the urinary flow against the neck of the bladder, or

even into the prostatic portion of the urethra, and block the passage, thus giving rise at first to hypertrophy to overcome the resistance, but eventually to atrophy and pouching of the walls of the bladder. Cystitis is not an infrequent sequela of the presence of a tumour in the bladder. A growth, whether pedunculated or sessile, growing close to, or from, the margins of a ureteral opening may block the canal, and thus give rise to dilatation of the ureter with other backward pressure changes, resulting in destruction of the corresponding kidney.

Papillomata are occasionally found devoid of elongated fimbriæ, consisting of more or less dense fleshy masses covered by extremely short, thick-set papillæ, giving the general contour of the tumour a more or less smooth, though sometimes lobulated, appearance. These are termed 'fibro-papillomata.' Structurally they are composed of the same elements that enter into the villous papillomata, but more densely arranged. Tumours of this type are, as a rule, sessile, slower in their growth, and do not attain the large size of the fimbriated papillomata.

When a growth is recognised by a cystoscope to be covered by villi, we must not at once come to the conclusion that it is necessarily of a benign type, for malignant tumours are sometimes clothed with villi, and these growths may occur as more or less pedunculated tumours. It is characteristic of a benign growth that there is no hardness about its base or pedicle, and that the mucous membrane in its vicinity is soft and devoid of infiltration. The existence of hardness of the base, or infiltration in the adjacent mucous membrane, at once arouses suspicion of malignancy.

Intermediate between the typically benign papillomata and malignant tumours comes a type known as 'transitional.' Tumours of this nature on first removal present all the appearances of simple growths, both macroscopic and

microscopic, save that the ground-work is more dense and irregular, and the 'presence in it of irregularly shaped cells, which do not belong to normal tissue on the one hand, or to distinct new growth on the other' (Heneage Gibbs). Tumours of this type have a tendency to recur after removal, becoming more and more fleshy, with infiltration of the surrounding mucous membrane on each recurrence, the patient eventually dying from undoubted cancer. A typical case of this kind occurred in a lady, aged fifty-four years, sent



FIG. 96.

to me by Mr. W. Armstrong, of Buxton. The tumour (Fig. 96), which was sessile and of the size of a large walnut, showed no signs of malignancy on first removal, but it recurred, and after being four times removed, together with the adjacent mucous membrane, from the vicinity of the left ureteral opening, eventually recurred as carcinoma on the right side of the bladder, to which the patient succumbed.

Adenomata rarely, if ever, occur in the bladder, as might be expected, seeing that it is doubtful if true glands exist in its

mucous membrane. In the few instances that have been placed on record by writers the tumours were found in the vicinity of the neck of the bladder. There is nothing in the descriptions of these cases to indicate that they were other than adenomata of the prostate, projecting into the bladder. In my recent practice of total enucleation of the prostate I have found that barnacle-like adenomatous outgrowths of the prostate may appear in the bladder at a considerable distance from that organ, connected therewith by long, slender, fibrous pedicles, or 'runners,' lying beneath the mucous membrane. These might easily be mistaken for adenomatous tumours of the bladder.

Epithelioma, or squamous-celled cancer, as a primary disease of the bladder is not uncommon, ranking next in frequency of occurrence after papilloma. It occurs in the latter half of life, being extremely rare before the age of forty years. It has its origin in the mucous membrane, and may commence as a warty outgrowth, a simple fissure, or an irregular ulcer. In whatever form arising the disease advances rapidly, spreading over an extensive area of mucous membrane and invading the underlying tissues. Large, elevated, fungating masses and hard nodules soon project into the bladder, sloughs are thrown off, accompanied by fœtid discharges, and life is rapidly destroyed through loss of blood, infection of the lymphatic system, as well as from the pain and constant distress due to frequency of micturition and perpetual straining, the bladder being unable to retain more than a small quantity of urine. The glands affected are the pelvic, retro-peritoneal, inguinal, and lumbar. Secondary deposits in other organs are, however, rare. As already stated, a cancer may have villi projecting from its surface; it is then termed a 'villous carcinoma.' In the later stages of the disease an epithelioma of the bladder may ulcerate into the bowel, a fistula being thus established, and fæces passing

through the urethra, and urine by the rectum. Or it may appear in the groin, causing pressure on the nerves and vessels, and giving rise to severe pain and œdema in the corresponding lower limb. It may make its way through the sacro-sciatic foramen and involve the sacral nerve.

Tumours of the connective-tissue type are of rare occurrence in the bladder.

1. **Fibroma.** — This tumour, though nearly allied in structure, must not be confounded with the fibro-papilloma already described. The latter has its origin in the mucous membrane, whereas the fibromata spring from the sub-mucosa or fibrous tissues in the muscular coat, and have the mucous membrane simply stretched over, but not involved in, the growths. The fibromata are rarely pedunculated, being usually sessile, or subsessile, polypoid outgrowths, and they are usually single. They are almost invariably found in adults. As a rule, they spring from the base of the bladder, but the only instance of this tumour that I have met with in my practice sprang from the summit of the bladder near the orifice. It was of the size and shape of the adult thumb, and hung down over the neck of the bladder, obstructing the urinary flow. Fibromata are composed of adult connective tissue, with a few elastic fibres and fusiform cells interspersed. They are smooth-surfaced, and on section present a white, glistening appearance.

2. **Myxoma.** — The myxoma, closely allied to the fibroma, is the soft, gelatinous, mucous polypus, similar in structure to the nasal polypus, except that the covering epithelium is squamous. It is, as a rule, composed of a soft, gelatinous, proteid substance, identical with that found in the umbilical cord; but some varieties are harder, containing a considerable admixture of normal fibrous tissue. Growths of this type occur only in young children, and may be either sessile or pedunculated. They are generally multiple.

3. **Myomata.**—These are composed mainly of unstriped muscle fibres, interspersed with scanty fibrous tissue. They are of extremely rare occurrence. They have their origin in the muscular coat of the bladder, and may project inwards, forming ‘intravesical’ sessile or pedunculated growths, loosely covered by the mucous membrane. They may remain ‘interstitial,’ or project outwards from the surface of the bladder, covered by the peritoneum, forming ‘paravesical’ tumours. When growing inwards they rarely attain a large size, and are easily enucleated. The largest intravesical growth of this kind on record, as far as I am aware, occurred in my practice. The patient and tumour were shown at a clinique in the Medical Graduates’ College and Polyclinic on January 15, 1902. The details of the case have been already reported,* and briefly are as follows:

A married female, aged twenty-four years, had suffered from hæmaturia, increased frequency of micturition, and stoppage of the flow of urine for four years, with a tumour gradually increasing in size and eventually projecting into the anterior portion of the vagina. When she first came under observation in October, 1901, the tumour was as large as a cricket ball. It projected into the vulva, and was covered by the anterior wall of the vagina, which was pushed down before it. With a finger in the vagina and a hand placed above the pubes, the tumour could be rolled about a fixed point in the left half of the pelvis. The patient had to push it up from the vulva before micturition, which sometimes required the catheter. Cystoscopy revealed a large, smooth, globular, sessile tumour of the bladder, with large veins coursing over it, springing from the trigone and left side of the base of the bladder and in front of the left ureteral opening. On October 30, 1901, I opened the bladder suprapubically and snipped the mucous membrane over the

* *Journal of the British Gynæcological Society*, vol. i., 1902.

tumour, which was rapidly and easily enucleated. The patient made a rapid recovery, leaving St. Peter's Hospital within a month. She is now in excellent health, untroubled by any urinary symptom. The tumour weighed 9 ounces, and was found on microscopic examination to be a pure myoma.

4. **Sarcoma.**—This is the most common of the tumours of the connective-tissue type found in the bladder, but even this is rare in comparison with epithelial growths. It may occur at any age, arise in any part of the bladder, and is invariably sessile. It occurs as a smooth, dense, rapidly-growing tumour, involving the entire thickness of the bladder wall. The round- and spindle-celled varieties are those most frequently found.

Other tumours of the connective-tissue type are of extreme rarity in the bladder.

Symptoms and Diagnosis.

Hæmaturia is the most important, as it is almost invariably the earliest, symptom in all forms of tumour of the bladder. If a patient consults you for hæmaturia coming on spontaneously without apparent cause, you should at once suspect the presence of a vesical growth, and if the hæmaturia be painless, the growth will in all probability turn out to be benign. The hæmaturia is, as a rule, intermittent, the attacks lasting from one to several days, and completely ceasing in the intervals. In the early history of the disease the intervals may be prolonged, weeks or even months elapsing before a recurrence of bleeding takes place; but as the disease progresses, the attacks of hæmaturia increase in frequency and intensity. Eventually the urine may never be quite free from blood, though at times the bleeding will be more profuse than at others. The urine is not uniformly mixed with blood, as in hæmorrhage from the kidneys.

During the act of micturition it will be noticed that the earlier portions of the urine will be clear and free from blood—at least, to the unaided eye—and that the stream gets gradually deeper in colour, till eventually pure bright blood is passed. Occasionally the urine may be tinged with blood even at the commencement of micturition, but the tinge gradually deepens, and some pure blood is invariably passed at the end. Clots are frequently present—dark and irregular masses, contrasting with the worm-like clots found in connexion with renal hæmorrhage. The hæmaturia is generally independent of position and motion, occurring as frequently when the patient is sitting or lying down as when getting about, thus presenting a marked contrast with the bleeding attendant on stone, which is always worse when the patient takes exercise. Profuse hæmaturia is rare in connexion with stone, whereas with tumour it is the rule. The extent and frequency of the bleeding do not bear any proportion to the size of the tumour. A growth may attain a very large size before it is attended by hæmaturia, and quite a small growth, as in the case of Fig. 94, may involve profuse and constant bleeding, endangering life. Soft growths, and particularly those clothed with villi, bleed more freely than the dense and bald varieties, and pedunculated more than sessile growths.

Increased frequency of micturition occurs sooner or later with all vesical growths, and once it sets in it never disappears till the tumour is removed. It is most marked in cases of growth situated near the neck of the bladder. Exceptionally it is the initial symptom, and may exist for lengthened periods before hæmaturia supervenes. In the case of a lady, aged fifty-three years, whom I attended in consultation with Dr. W. H. Bourke, of South Kensington, increased frequency of micturition, attended latterly by some scalding, had existed for two years, but there had never been any hæmaturia. The cystoscope at once revealed a pedun-

culated villous growth, of the size of a large strawberry, springing from near the right ureteral opening, which I successfully removed suprapubically. Two symptoms—viz., increased frequency and pain—are not uncommon in women who have passed middle life, and are, as a rule, due to pressure of the womb on the bladder. I was inclined to attribute the symptoms in this case to this cause, and it was only after Dr. Bourke had assured me that he had satisfied himself that this was not the case that I consented to examine the patient cystoscopically. This and other cases in my practice have taught me a lesson—viz., that when these symptoms are due to no apparent cause the cystoscope should be employed, even when hæmaturia is absent. The hæmaturia and frequency of micturition due to non-malignant growths are in the earlier stages of the disease, as a rule, unattended by pain, but in malignant growths pain is present almost from the beginning.

Pain is nearly always present in the later stages of all kinds of tumour, due to a variety of causes, such as cystitis, passage of clots, blockage of the urethra by the growth, or pressure of the growth on the nerves as it enlarges. Sessile and infiltrating growths are more painful than pedunculated ones. The pain will, as a rule, be referred to the perineum, or as shooting along the whole urethra, in contrast with the pain of stone, which is referred to the end of the penis, and that of prostatic disease, which is usually felt suprapubically.

Retention of urine, partial, as a rule, but occasionally complete, may occur, due to clots, fragments of tumour tissue, or even a pendulous growth itself blocking the urethra.

With these symptoms we may find detached **shreds of tumour tissue** in the urine, microscopic examination of which may give a clue to its nature, always bearing in mind that benign villousities may grow on a malignant base.

Pus in the urine will be present when cystitis occurs. This is rare in benign growths, particularly in the earlier stages, unless from septic instrumentation. It frequently occurs early in malignant growths, and is always present in their later stages as a terribly painful and distressing complication.

Not infrequently the inflammation from cystitis extends along the ureters to the kidneys, giving rise to pyelitis, nephritis, and suppuration of the kidneys. Blockage of a ureter by the tumour may give rise to hydronephrosis; blockage of both ureters may cause anuria and uræmic symptoms.

Rectal examination in the male and vaginal in the female will aid us in forming a diagnosis, but only in cases of malignant growths in which the base of the bladder may be felt nodulated and unyielding from infiltration of its walls, or in the case of large fibrous or myomatous growths arising in this position. A papillomatous benign growth, whether sessile or pedunculated, will not be felt per rectum. When the tumour attains a large size, whether malignant, fibrous, or myomatous, it may be felt bimanually by placing one hand above the pubes and a finger of the other hand in the rectum or vagina.

With the presence of the symptoms described a sound will probably be employed to ascertain if a stone be present in the bladder. No definite information as to the presence of a growth can be obtained by this means, though a sensation as of the existence of an undefined soft, or even tough, mass in the bladder, and limitations of the movements of the instrument, may lead us to suspect the presence of a tumour.

Washing out the bladder by means of an evacuator and catheter and the introduction of a lithotrite with a view to detaching and bringing away portions of the tumour for

examination were formerly employed; but such methods have now been abandoned since the introduction of the electric cystoscope, which provides us with a scientific and accurate means of arriving at a definite diagnosis as to the presence of a tumour as well as to its size, physical characters, position, and form of attachment to the bladder wall, as also to a fairly accurate forecast as to its nature.

Treatment.

Though the hæmorrhage, pain, and other systems attendant on tumours of the bladder may be temporarily held in check by astringents and narcotics, administered internally or locally applied, the only line of treatment that offers a prospect of permanent relief consists in complete removal of the growth. Following the lead of Sir Henry Thompson, for some years after 1880 surgeons generally accomplished this by means of perineal cystotomy. I myself have removed several tumours through this route with considerable success. But this method has now for several years been practically abandoned in favour of operation through the suprapubic route, which possesses the advantages that not only can a more thorough survey of the bladder be made in this way by the finger, but by means of an electric forehead light and appliances that will presently be described the interior of this viscus and its contents can be brought into view, so that the tumour can be removed with greater precision than by the perineal route.

Suprapubic Cystotomy.—The patient, previously prepared by shaving the pubes and applying an antiseptic compress over the pubes and hypogastrium, is placed on his back on the operating-table. The Trendelenburg position advocated by some surgeons is quite unnecessary. A rubber catheter is introduced, the urine is drawn off, and the bladder is

thoroughly washed out with warm boric lotion by means of a 6- or 8-ounce syringe. Petersen's bag for inflating the rectum previously to distending the bladder with a view to raising the peritoneum out of the way was formerly much in vogue. I constantly employed it for some years after its introduction, but have now entirely abandoned this adjunct to the operation as unnecessary for the purpose for which it was introduced, and attended by inconvenience and considerable danger. It distorts the bladder out of shape, is liable to lacerate the mucous membrane of the bowel, and cases are on record where rupture of the bladder attended its employment. The bladder is simply distended with from 10 to 14 ounces of warm boric lotion, and the catheter is left *in situ* with a clip forceps applied to prevent the lotion flowing out.

An incision of from 2 to 3 inches in length, according to the stoutness of the patient, is now made in the median line of the abdominal wall terminating at the symphysis pubis. This incision is carried at once through the skin and subcutaneous tissues as far as the muscles. Any bleeding vessels are clamped, and the incision is continued either between the recti muscles or through one of them till the prevesical fat comes into view. The point of the forefinger is then introduced through the wound and passed down close behind the symphysis, the prevesical fat is scraped through by the finger-nail till the bladder is reached, and is drawn upwards off the bladder for the whole length of the wound, the peritoneum, if extending low down, being pushed up before it. As a rule, the peritoneum is not seen, being covered by the fat.

The bladder will now have come into view, presenting a greyish glistening appearance, with purple, gorged, tortuous veins coursing in its wall and visible on its surface. The scalpel is at once plunged through the bladder wall in the middle line, with its edge directed downwards towards the

symphysis, and an incision 1 inch or $1\frac{1}{2}$ inches long is made in this direction. Neither a sharp hook nor sutures inserted in the bladder, to hold it up in position, are necessary.

The knife is now withdrawn and laid aside; and as the fluid rushes out, the forefinger is introduced into the bladder.

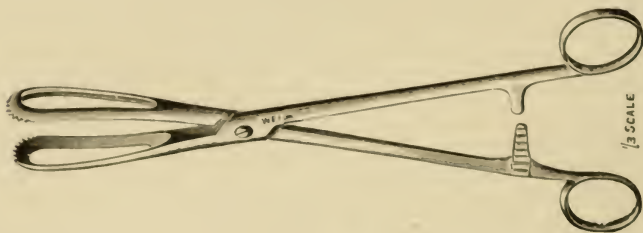


FIG. 97.

plugging the opening. If a tumour of considerable size be present, it will be felt at once projecting into the fluid in the distended bladder. The fluid is allowed to trickle away slowly by the catheter, and the finger makes a methodical survey of the bladder, ascertaining the size, consistency, position, and mode of attachment of the growth, many of

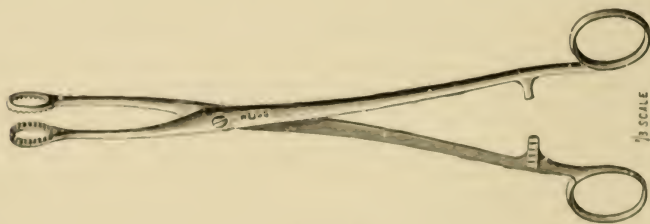


FIG. 98.

which particulars will have previously been recognized by the cystoscope.

Removal of the Tumour.—A suitable tumour forceps (Figs. 97, 98, 99, 100) is now introduced beside the finger, but before doing so the bladder is distended with lotion through the catheter, which should be withdrawn till its end just reaches

the inner orifice of the urethra, so as to be out of the way of the forceps. Keeping the point of the finger in contact with the tumour, the blades of the forceps are opened, and the pedicle of the growth—if it be pedunculated—is grasped as near to the bladder wall as possible, and

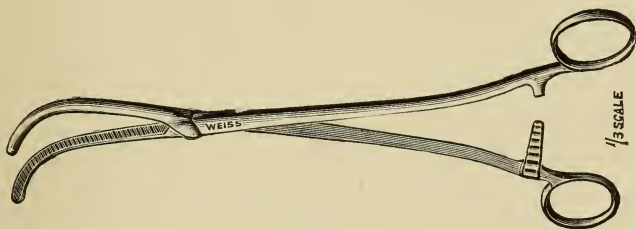


FIG. 99.

the growth is twisted off. If the tumour be sessile, forceps with broad serrated jaws (Fig. 97) will be necessary, by which the growth can be grasped flush with the mucous membrane of the bladder, and removed partly by biting it away and partly by torsion. If the sessile growth be a large one, it

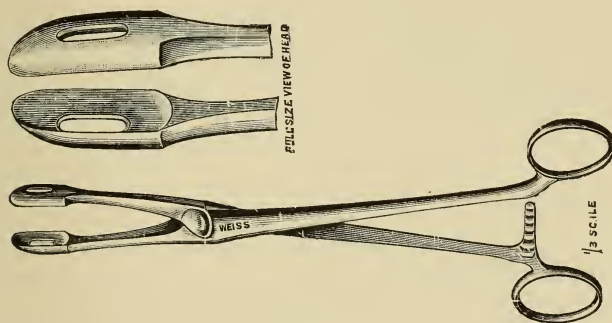


FIG. 100.

will have to be removed piecemeal, the forceps being introduced over and over again, the bladder being kept distended by an assistant throughout the manipulations; otherwise there would be danger of the rugose folds of the bladder getting nipped between the jaws of the forceps and thus injured.

When the tumour has been excised as far as possible in the manner indicated, an ordinary glass Fergusson's vaginal speculum is introduced—the largest size that will readily pass through the incision in the bladder being employed—and directed on to the site of attachment of the growth. The lotion is allowed to flow away, and any remaining fluid is mopped up by sponges introduced on holders through the speculum. An electric forehead lamp (Fig. 101) is employed to illuminate the bladder through the speculum.

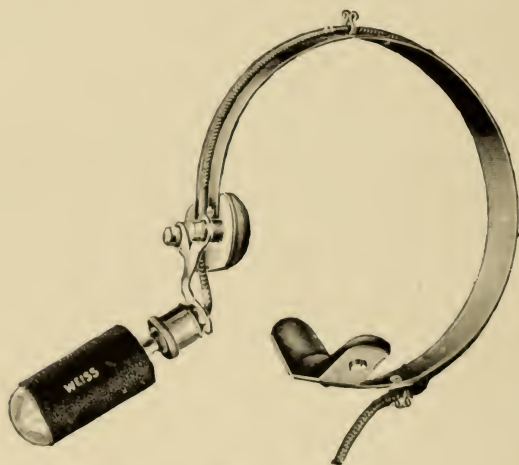


FIG. 101.

The distal end of the speculum being pressed firmly against the site of attachment of the growth, and the fluid being thoroughly mopped up by sponges, the site of the growth is brought clearly into view by means of the electric forehead lamp. Any shreds of growth or nodules left behind will be observed in this manner, and can be removed by forceps introduced through the speculum. The electric, or Paquelin's, cautery can also be introduced through the speculum to burn away the roots of the growth or to arrest hæmorrhage.

Tincture of perchloride of iron can also be introduced on a sponge for the latter purpose.

If the growth be sessile, and particularly if there be any doubt as to the infiltration of the adjacent mucous membrane, the tumour may be grasped boldly by forceps and brought well up into the wound. This will be facilitated by an assistant placing his finger in the rectum and pushing the base of the bladder up towards the suprapubic wound. The mucous membrane of the bladder is incised all round the base of the growth, but quite clear of it, and this together with the tumour is removed by broad serrated or cutting forceps (Figs. 97, 100).

It is unnecessary, and, indeed, inadvisable, to attempt to bring the edges of the mucous membrane together over the site of the tumour by sutures. It is difficult to introduce sutures at the base of the bladder. It is inadvisable to employ other than catgut sutures, and they are absorbed too rapidly to be of any practical use; silk sutures should never be used, as they form nuclei for the formation of calculi. The tissues are so crushed by the forceps in the removal of the growth that it is doubtful if direct union could take place in any case. Healing of the wound takes place by granulation.

The bladder is now thoroughly irrigated by warm boric lotion through the catheter and out by the suprapubic wound till all clots are removed and the fluid flows away clear. A drainage-tube with two eyes cut in it on opposite sides at a distance of about $\frac{1}{2}$ inch from the end (Fig. 66) is introduced by means of forceps. This should be sufficiently thick to fill the wound in the bladder, so that the whole of the urine may flow by this route, and thus avoid its trickling beside the tube and entering the prevesical space. No object is gained by employing a narrow tube, as in practice it is found that the suprapubic wound heals as

rapidly when a large tube is used; and a narrow tube has the disadvantage of allowing the urine to flow beside it, thus infecting the loose areolar tissue in the prevesical space, which in consequence would slough away in gangrenous masses, and of preventing clots from passing out of the bladder.

The abdominal wound is now brought together round the tube by means of three or four silkworm-gut sutures, which are passed through skin and muscle, and, finally, the drainage-tube is fixed in position by means of a superficial suture. Buried sutures should not be employed in suprapubic cystotomy, as they almost invariably get infected by urine, and lead to suppuration. I never entirely close the bladder wound, invariably introducing a drainage-tube; but when for any reason the incision in the bladder is extensive, I bring the wound partly together by catgut before introducing the tube. The drainage-tube is cut short, $\frac{1}{2}$ inch from the superficial wound, cyanized gauze, well wrung out of boric lotion, is applied, and the front and sides of the abdomen are covered by large pads of cotton- or wood-wool. The dressings are changed every four or six hours as they become saturated with urine. I have tried appliances of all kinds for conducting the urine directly from the bladder to a receptacle beneath the bed, but have found most of them unsatisfactory, and I now seldom employ any but the simple method above described.

My friend Mr. Hamilton Irving, recently, when House Surgeon at St. Peter's Hospital, devised a very ingenious apparatus for this purpose (Fig. 102). It consists of an inverted dish with bevelled edges, made of celluloid, which covers the wound, and is held in position by an abdominal belt. The urine flows away through two rubber tubes into a urinal placed between the patient's legs. This is the only apparatus that I have seen that is safe and fairly efficient.

In prostatic cases it should not be applied for four or five days after operation, as it everts the edges of the wound by pressure on the surrounding parts.

The skin sometimes has a tendency to get irritated by the saturated dressings; at the earliest indication of this it should be protected by rubbing in lanolin or oxide of zinc ointment at each dressing after thoroughly washing and drying the surface. The drainage-tube is removed in three or four days, when plastic lymph will have been thrown out along its track and the tissues thus protected from infiltration of urine. The bladder should be irrigated through the drainage-

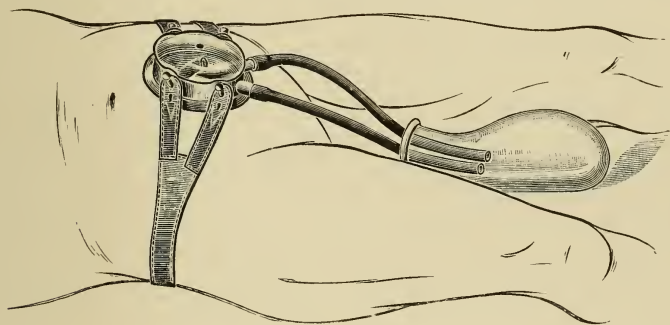


FIG. 102.

tube daily, or more frequently if the tube gets blocked by clots, by warm boric lotion. After the tube is removed a soft catheter is introduced daily, and the bladder is irrigated through this and out by the fistula. The sutures are removed on the seventh or eighth day; but should the temperature rise and the wound appear 'angry,' one or more sutures should at once be removed to give vent to pent-up fluids in the prevesical space. The fistula takes from a fortnight to a month to close as a rule.

When a malignant growth is so extensive that no attempt at its removal is desirable or practicable, it may be necessary to open the bladder and to establish permanent drainage for

the purpose of ameliorating the terrible pain and strangury that exist, particularly when general infective cystitis sets in, and so to allow the patient to pass away in comparative comfort. The perineal or suprapubic route is chosen, according to the nature and position of the growth, so as to afford free drainage and at the same time to avoid pressure of the tube on the growth.

Resection of that portion of the bladder wall involved in a malignant growth, and even of the entire viscus, has been undertaken—the ureters in the latter case being implanted in the rectum in the male or in the vagina in the female—hitherto, however, with but poor success. When the growth is confined to the apex of the bladder, where the resection can be performed extra-peritoneally by stripping off the peritoneum over an extensive area, I consider that the operation is not only justifiable but advisable. Unfortunately, however, these **growths** are rarely confined to this region. When involving the base of the bladder, I consider any attempt at resection futile, and that if the patient does not succumb immediately to the shock and hæmorrhage attending the operation life is materially shortened thereby.

LECTURE XIII

CYSTITIS AND PROSTATITIS

Cystitis.

CYSTITIS, or inflammation of the bladder, is the most common affection of that organ. Indeed, there are few other diseases of the bladder, or affections of the prostate and urethra, that run their course without cystitis occurring as a complication at some period in their history. This disease is rare in childhood, but common in adult life and advanced age, owing to the fact that the contributory causes of the disease are mainly confined to these latter periods.

It is now universally recognized that cystitis is in all cases due to the growth of pathogenic germs in the bladder, which induce purulent inflammation of its tissues. But though the micro-organisms are invariably the immediate cause of cystitis, they are helpless as noxious agents except under certain conditions favourable to growth—viz., traumatism, congestion, or retention of urine. Any condition that leads to retention of urine, such as enlargement of the prostate, is peculiarly favourable to the production of cystitis, for stagnant urine at the temperature of the body containing epithelium thrown off from the bladder wall forms an ideal nidus for the growth of bacteria that gain entrance from without.

Cystitis as an idiopathic disease is of rare occurrence; it

almost invariably supervenes on one or other of the following predisposing causes :

1. Chronic enlargement of the prostate. This is the most frequent cause of cystitis. It is, indeed, rare for a case of enlargement of the prostate to run its course without being complicated by an attack of cystitis, and in most instances cystitis becomes a chronic accompaniment of this malady. The employment of the catheter offers a ready means of microbic invasion, and the retained urine and congestion of the mucous membrane of the bladder, particularly that portion covering the outgrowth of the prostate, constitute favourable conditions for bacterial growth. Cases of cystitis in connexion with this disease are, however, not infrequently met with before any instrument has been employed, due to microbic invasion by some other route.

2. Stricture of the urethra is a common cause of cystitis. The dilated and congested urethra immediately behind a tight stricture favours the growth of bacteria, which sooner or later migrate into an over-distended and congested bladder, which, as in the case of prostatic hypertrophy, is prone to microbic development, resulting in septic infection. The repeated passage of instruments for its dilatation favours the introduction of bacteria from without, unless the most scrupulous antiseptic precautions are adopted.

3. Vesical calculus is almost invariably attended by cystitis at some period in its history, the congestion or injury to the bladder wall caused thereby favouring bacterial infection. Formerly, in the days of removal of stone by repeated crushings, cystitis was an extremely common occurrence, due to the sharp fragments left behind, so much so that the late Sir Henry Thompson regarded this as a separate form of the disease ; but it should rarely attend the modern operation of litholapaxy when properly performed, the débris being completely evacuated.

4. A foreign body in the bladder favours the development of cystitis in the same way that a stone does.

5. Injudicious sounding, or cystoscopic exploration for stone, foreign body, or vesical growth, either through sepsis or actual injury to the bladder wall.

6. Tumours of the bladder are frequently complicated by cystitis, owing to the congestion of the mucous membrane, retention of urine, and presence of blood attendant thereon—conditions that favour the development of pyogenic bacteria.

7. Tuberculosis of the bladder. The tubercle bacillus itself is capable of producing a low form of cystitis, but it is only when a mixed infection occurs, through the introduction of instruments or otherwise, that the symptoms become extremely distressing.

8. Gonorrhœa. Cystitis is not an infrequent sequela of this disease; it generally sets in about the third week, and is due to pyogenic bacteria passing into the bladder through the sphincter urethræ, or by extension in the mucous or sub-mucous tissues. Whether the gonococcus itself can cause cystitis is still a moot point.

9. The injection of strong and irritant fluids into the bladder.

10. Exposure to cold and wet. The cystitis due to this cause is usually of a mild character. It generally occurs in a bladder susceptible to microbic invasion owing to congestion or retained urine.

11. Paralysis of the bladder, partial or complete, due to cerebral or spinal injury or disease. The resulting stagnant urine and trophic changes in the mucous membrane favour the growth of micro-organisms. In cases of this nature, bacteria that possess the power of decomposing urea, setting free carbonate of ammonia, an intensely irritant substance, have a tendency to flourish.

12. Locomotor ataxy, in which cystitis is frequently an early and distressing complication.

13. Infection from adjacent organs, as :

(a) Prostatic abscess, bursting into the bladder.

(b) Pus, descending from the kidneys or ureters.

(c) Vesico-intestinal fistula. The cystitis due to this cause is of the most distressing character, as a rule.

(d) Uterine abscess communicating with the bladder.

14. Traumatic causes, such as gun-shot injuries, pressure of pessaries on the bladder, or of the fœtal head in parturition. (Cystitis is a common disease in women as the result of uterine complaints, whether from mechanical pressure or from septic invasion through the urethra from vaginal discharges.)

15. The *Bilharzia hæmatobia*, invading the bladder, produces congestion of the mucous membrane, and eventually cystitis from microbic invasion supervenes.

16. Certain constitutional diseases, such as gout and rheumatism.

17. Acute infectious diseases, such as enteric fever, scarlet fever, diphtheria, and influenza, are frequently complicated with cystitis, owing to the poorly nourished mucous membrane of the bladder being deprived of its resistance to bacterial invasion. But whether the micro-organism of the particular disease is capable of producing septic cystitis is still a moot point.

18. The ingestion of certain irritant poisons, such as cantharides, the balsams, turpentine, and corrosive sublimate.

Quite a variety of micro-organisms are found in association with cystitis, the most frequently met with being the *Bacillus coli*, *Streptococcus pyogenes*, *Staphylococcus pyogenes*, and the *Urobacillus liquefaciens septicus* or *proteus* of Hauser, all of which are pyogenic and possess the power of decomposing urea and setting free carbonate of ammonia.

These organisms may invade the bladder by four distinct routes—viz., through the urethra, by descent from the kidneys

with the urine, through the bloodvessels directly to the mucous membrane, and along the lymphatics from neighbouring organs.

The pathological changes are briefly as follow. Seen through the cystoscope in the early stages of acute cystitis, the mucous membrane is intensely congested and of a bright red colour, most marked, as a rule, on the trigone and in the vicinity of the neck of the bladder. Scarlet branching lines will be distinctly noticed, indicating the distended capillaries. Intermingled with these there will be minute points of extravasated blood. The characteristic white, glistening appearance of the mucous membrane will have disappeared and given place to a ground of dull greyish hue. The mucous lining may be swollen and œdematous in patches, and flakes of lymph may be adherent thereto. Later on there will be superficial ulceration, and in the severer forms of the disease the submucous and muscular tissues will become thickened and lose their elasticity, so that the cavity of the bladder is contracted. Abscesses may form therein and burst into the bladder, or the inflammation may extend even to the serous surface and cause adhesions to the adjacent tissues.

A rare form of cystitis is that known as 'membranous' or 'diphtheritic,' which is attended by violent inflammation of the bladder, followed by necrosis of the superficial layers of the mucous membrane. These exfoliate, and are occasionally discharged as entire casts of the bladder. I have seen two such instances, one in a male and the other in a female. It struck me as extraordinary that such a bulky formation could be passed through the male urethra. These false membranes, which are usually of a dark grey colour, consist of fibrin, epithelial cells, and triple phosphates, intermingled with which are hosts of bacteria.

If the disease passes into the chronic form, the mucous

and submucous tissues will be thickened and sclerosed. Ulcers will form, and will generally be covered by layers of phosphates. The muscular bundles eventually become hypertrophied, between which the mucous membrane bulges out, forming sacculi, thus giving the bladder a trabecular appearance. In some cases the walls remain permanently thickened, the cavity of the bladder being contracted; in others the thickening disappears by fatty degeneration of the muscles, and the walls become thinned, with marked increase in the capacity of the bladder.

The surface is frequently covered by granulations and villousities, developed to such an extent as to resemble small papillomata. Dense, irregular masses and shreds of mucus adhere to the walls, and when seen through the cystoscope wave about under the influence of disturbances of the fluid. The surface may be covered by this dense mucus to such an extent that the walls of the bladder are not visible. If hæmorrhage has taken place the bladder-walls and its contents may be of a dirty brown colour.

Cystitis may be of the *acute*, *sub-acute*, or *chronic* form. The two first varieties differ only in the severity of the symptoms, and the last is merely a stage of the others.

The symptoms of acute cystitis are local and constitutional. Increased frequency of micturition is usually the earliest symptom. Then there will be urgency; as soon as the desire to empty the bladder occurs its immediate accomplishment is imperative. There will be pain of two distinct kinds—one of a dull, aching character above the pubes, with tenderness on pressure in this region, and a sensation of weight in the perineal and anal regions, most marked before micturition, when the bladder is distended with urine; the other of a burning or scalding character at the end of micturition, and lasting for a variable period after the act. There will be tenesmus, or straining of the bladder to get rid

of some drops of urine even when the organ has been already emptied. Oozing of a few drops of blood at the end of micturition and during the straining is not uncommon. Then there will be a febrile condition of the system generally, possibly attended by chills and rigors, anorexia, flatulent distension of the stomach and intestines, constipation, and loss of sleep. The urine will be cloudy from the presence of mucus at first, and, as the case progresses, from pus, and it will have a disagreeable odour.

In the treatment of acute cystitis a threefold object should be kept in view—to give rest to the bladder and relieve pain, to render the urine bland and antiseptic, and to diminish pelvic congestion.

The patient should remain in bed, lying on his back with the knees drawn up to relax the abdominal muscles, and the pelvis raised on a pillow, so that the intestines may gravitate away from the bladder and thus relieve pressure thereon. Hot hip-baths should be given two or three times daily, and in the intervals hot fomentations should be applied to the hypogastrium and perineum. Opiates, in the form of hypodermic injections of morphia, or suppositories of morphia combined with belladonna, should be administered in sufficiently large quantities to relieve pain, but sparingly should the kidneys be unsound. Demulcent drinks—such as barley-water, linseed tea, decoction of *triticum repens*—should be taken freely; and when the urine is very acid, as it usually is in acute cystitis, to these should be added alkalies, such as bicarbonate of soda, citrate of potash, or liquor potassæ, in sufficiently large quantities to render the urine neutral or faintly acid. Full doses of tincture of *hyoscyamus* added to these will have a soothing effect on the bladder and help to relieve the tenesmus. Urinary antiseptics—such as boric acid (10 grains), salol (5 grains), or urotropin (5 to 10 grains)—are given three times daily when the urine is foul. The

bowels should be kept open by laxatives and a milk diet enjoined, stimulants on no account being allowed.

When tenesmus is excessive relief may be given by passing the bulb of a Guyon's syringe (Fig. 46) just beyond the compressor urethræ muscle and slowly injecting 15 to 20 drops of a 4 per cent. solution of cocaine into the posterior urethra, whence it trickles into the bladder.

Under this treatment an ordinary attack of acute cystitis, unattended by, and independent of, urinary obstruction, disappears in the course of ten or fifteen days. But occasionally it subsides into a chronic cystitis, in which the pain, urgency, tenesmus, and constitutional symptoms disappear or are much less pronounced, but the urine remains thick and offensive, containing pus and mucus, and the frequency of micturition continues owing to the sensitive lining membrane resenting distension of the bladder by the accumulating urine.

At this stage of the disease, but not before, local applications are valuable, the most efficient being the injection of a weak solution of nitrate of silver in the manner that will presently be described.

When, however, urinary obstruction exists, due to stricture, enlarged prostate, vesical growth, or calculus, the acute cystitis will almost invariably terminate in the chronic form of the disease. And though this may be relieved temporarily or held in check by the measures to be presently described, the tendency to its recurrence, with occasional outbursts of acute or subacute cystitis, will remain till the cause of the obstruction has been removed.

The most characteristic feature of this form of cystitis is the presence in the urine of a thick, tenacious, ropy mucopus. The disease is commonly known as 'catarrh of the bladder.' If the contents of a vessel in which urine of this kind has stood for some time be poured out, the mucopus will be found to have subsided and to have formed a thick,

gelatinous mass adherent to the bottom, remaining behind when the supernatant urine flows off. The urine will be ammoniacal, extremely offensive, will swarm with bacteria, and contain large quantities of the triple phosphates.

As already indicated, nothing will effect a permanent cure of this form of cystitis till the cause of the obstruction is removed. If stricture be present, it must be dilated or cut; if stone, it must be removed by litholapaxy or lithotomy; if due to enlarged prostate, the organ must be enucleated; if a vesical growth be present, this must be excised if possible. The cystitis will then, in the majority of cases, automatically disappear, the bladder conditions being no longer favourable to bacterial development. But should it not do so, the employment of local and general remedial measures hereafter described will rapidly effect a cure; and in all cases their application will hasten the disappearance of the cystitic symptoms.

But there may be conditions and complications present which contra-indicate operation, or render it unusually hazardous; and even where such do not exist, patients will frequently not submit to operation till driven to it by intense suffering or immediate danger to life. Fortunately we can, by local and general treatment, even in such cases, do much to subdue the disease and render life bearable.

Let us now consider the treatment of chronic cystitis in general. The first point to attend to is that the bladder be emptied of its contents at regular intervals. Should this not be accomplished naturally, owing to obstruction or paralysis of the bladder, a catheter must be introduced once, twice, or more frequently, daily, according to the necessities of the case. Metal instruments should not be employed for this purpose, as they cause irritation. A rubber catheter, or a cylindrical coudée or bicoudée one should be used—which ever passes most readily. The complete evacuation of the

bladder is essential, because the urea of stagnant urine is readily decomposed by pyogenic microbes into carbonate of ammonia, an irritant substance, which intensifies the already unhealthy conditions of the bladder.

The next thing is to irrigate the bladder twice daily in order to get rid of the mucus, pus, and other putrefactive elements that remain behind, free in the bladder or adherent to its mucous lining. The methods of doing this, and the remedial agents employed, are of vital importance, lest the irrigations, instead of accomplishing the object for which they are used, aggravate the diseased condition.

The most useful fluid for washing out the bladder is, perhaps, one consisting of a saturated solution of boric acid, to which is added an equal quantity of hot sterilized water to bring the whole up to the temperature of the body. The antiseptic properties of this solution are not very marked, but it is bland and soothing, and has a more or less stimulating and healing influence on the diseased mucous membrane.

This solution is introduced through the catheter by means of an irrigating apparatus, a metal syringe, or an indiarubber bottle fitted with a nozzle and stopcock. The fluid should be introduced slowly, not with force, and the quantity thrown in will vary with the capacity and tolerance of the bladder. In some cases several ounces will be tolerated, in others not more than an ounce or two. The quantity thrown in is regulated by the sensations of the patient. We should always stop short of causing painful distension of the bladder. The fluid is then allowed to flow out, and in cases of paralysis or atony of the bladder its exit should be facilitated by gentle pressure of the hand on the hypogastrium. This process should be repeated again and again till the return fluid remains unaltered.

In cases of enlarged prostate or stricture of long standing

the bladder will frequently be sacculated. Pouches are formed which act as receptacles for decomposing discharges. Washings, frequently repeated, may be required in such cases before the bladder and outgrowing cavities are completely emptied of their noxious contents.

Solution of permanganate of potash is an extremely effective antiseptic in bladder cases, and one which I have a great leaning to, in strength varying from 1 in 4,000 to 1 in 1,000. So are solutions of boroglyceride (1 in 16 of water), carbolic acid (1 in 500 to 1 in 250), resorcin (3 to 5 per cent.). Amongst other medicated injections may be mentioned acetate of lead (1 in 1,500), tannic acid (1 in 400), dilute nitric or phosphoric acid (1 in 200). It will frequently be advisable to change from one medicated solution to another in the same case, as most drugs when employed for some time have a tendency to lose their efficiency.

But the most efficient of all drugs in obstinate forms of cystitis is nitrate of silver. Commence with a weak solution, say $\frac{1}{15}$ grain to the ounce, and gradually increase the strength to $\frac{1}{2}$ grain. It is rarely that a stronger solution will be borne, and some patients will not tolerate even this strength. The strength of the solution should never be pushed to the extent of causing pain or strangury—merely till a feeling of warmth in the bladder lasting half to one hour after irrigation is reached. The drug should be dissolved in warm distilled water, for the salts contained in ordinary boiled water will neutralize a portion of the nitrate of silver, as is evidenced by the milky colour assumed by the solution, due to chloride of silver, an inert substance which has no action on the diseased conditions. None of this solution should be allowed to remain in the bladder. Before using the nitrate of silver solution the bladder should be washed out with sterilized water to remove the free discharges.

Janet's method of irrigating the bladder is most useful,

particularly when the cystitis is confined to the neck of the bladder and prostatic urethra, as it frequently is after gonorrhœal infection of the bladder. But it cannot, of course, be carried out unless the bladder has the power of automatically emptying itself.

In cases of this nature, of 'inflammation of the neck of the bladder,' as it is termed, the most efficient method of applying medicaments is by 'instillation' by means of a Guyon's catheter and syringe. The bulb of the syringe is passed just beyond the grip of the compressor urethræ muscle, and 20 to 40 minims of a strong solution of silver nitrate (1 per cent., gradually increased to 5 per cent.) is slowly injected drop by drop. The solution passes back, bathing the inflamed surfaces of the prostatic urethra and adjacent vicinity of the bladder, and is allowed to remain there. This may be repeated daily, or every second day, as may be found advisable.

Chronic cystitis is almost invariably associated with a debilitated condition of the system. Therefore measures should be adopted to improve the general health of the patient, such as change of air to a dry and bracing climate, tonics, and a light, nourishing diet; but stimulants are rarely admissible.

There are certain drugs which, given internally, have an undoubted influence in promoting resolution of this disease and assisting the local treatment. First among these may be mentioned the infusions or decoctions of *triticum repens*, *buchu*, *pareira breva*, and *uva ursi*. The first of these, the common couch grass, is most useful, and that which disagrees least with the stomach. A pint of the infusion may be taken daily in four equal doses.

Combined with these infusions we give one of the following urinary disinfectants: salol, 5 grains; boric acid, 10 grains; benzoic acid or benzoate of soda, 10 grains; urotropine,

helmitol, or hetraline, 5 to 10 grains, three times daily. Urotropine I find the most powerful urinary antiseptic. A combination of boric acid and benzoate of soda, of each 10 grains, I also find most effective in a large proportion of cases.

Then the balsams,—oil of sandalwood and copaiba,—given in capsules of 10 or 15 minims three times daily, are frequently of great use, particularly in that form of cystitis that prevails after gonorrhœa; but they frequently cause digestive troubles, and should then be at once discontinued. Oil of turpentine and tincture of cantharides, in 5-drop doses, three times daily, frequently exercise a favourable influence on this disease.

There are certain natural mineral waters, of which Contrexéville is the best type, the administration of which has a beneficial effect in promoting resolution of cystitis.

In the chronic form of this disease the urine is almost invariably alkaline. Consequently the administration of the dilute mineral acids would seem to be indicated; but beyond their tonic effect they have no influence in rendering alkaline urine acid.

Occasionally, in spite of these local and general measures of treatment, the cystitis still persists, and may threaten life by the severity of the bladder symptoms, or the danger of ascending pyelitis supervening. It will then be necessary to consider the advisability of having recourse to continuous drainage of the bladder.

The simplest form of continuous drainage consists in tying in a catheter, through which the urine flows continuously away, and through which irrigations can be effected. A soft rubber catheter or well-made gum-elastic one, of full size, is best; but this should be removed daily, sterilized, and again replaced. But it is rarely that the urethra will tolerate a catheter being tied in continuously for more than a week or

ten days, owing to the urethritis set up thereby. A metal catheter should never be employed for this purpose, owing to the irritation which it sets up.

Should continuous catheterism be found impracticable, or the putrefactive discharges be so thick and viscid that they will not flow readily through the catheter, or when large phosphatic concretions are present, it will be necessary to establish temporarily either perineal or suprapubic drainage, the latter for preference in the majority of cases. It is astonishing the rapidity with which the most rebellious forms of cystitis clear up, and the urine becomes quite healthy, with the ready exit of the contents of the bladder and facilities for efficient irrigation thus afforded.

The treatment of tubercular cystitis will be dealt with in a subsequent lecture.

Bacteriuria.

It will not be inappropriate to refer here to a peculiar condition occasionally encountered in which the urine swarms with micro-organisms without the presence of pus in the bladder. This disorder, which is termed 'Bacteriuria,' was, I believe, first described by the late Sir William Roberts (*British Medical Journal*, 1881, vol. xi., p. 359). Myriads of bacteria may be present in the urine, giving it a grey or opalescent appearance, for weeks, months, or even years, without giving rise even in the presence of retained urine to inflammation. The disease is one of the urine, not of the membranes of the bladder. The centrifugalized deposit consists entirely of micro-organisms and urinary salts. The urine grows denser on standing, and emits a peculiarly offensive odour. The organism found in Sir William Roberts's cases was the *bacterium termo*; but later investigators have most frequently found the *bacterium coli*. These organisms gain access to the bladder generally by instrumentation or

migration along the urethra; but in some instances they must have reached the bladder through the medium of the circulation.

The treatment consists in the administration of urotropin, or boric acid combined with benzoate of soda; and washing out the bladder daily with boric acid solution. Should these fail, the nitrate of silver solution must be employed as in case of chronic cystitis.

Prostatitis.

Nearly allied to cystitis is prostatitis, or inflammation of the prostate, whether regard be had to the proximity of the organs and tissues involved in the inflammatory process, the source of the infection, or the general symptoms of the diseases. Indeed, as a rule, neither of these diseases can be said to exist alone, entirely independent of the other; and that form of cystitis known as 'inflammation of the neck of the bladder' is in reality a combination of the two.

There are two types of this disease,—the *acute* and *chronic*,—having more distinctive characteristics than the acute and chronic stages or forms of disease in general possess.

In the acute form of the disease the inflammation commencing in the glandular structures rapidly extends to the parenchymatous tissue. The whole organ becomes swollen and gorged with dark blood, yielding on section a reddish turbid fluid composed of lymph, serum, blood, and prostatic secretion. As the disease progresses minute points of pus form in the gland-crypts or muscular tissue; and these eventually coalesce, forming one large irregular abscess involving one or both lobes, the pus being of a peculiar thick gelatinous character. The mucous membrane is injected, dark red, and thickened, with patches of greyish lymph adherent to its surface.

If allowed to run its course, the abscess most frequently

opens into the prostatic urethra, and the next act of micturition is accompanied by a copious discharge of pus. The passage of instruments for the relief of retention of urine frequently caused by the swollen gland may rupture the abscess in this direction. But the abscess may find its way into the rectum, burrow into the periprostatic cellular tissue, or even burst into the peritoneum, causing septic peritonitis. *Fistulæ* may result—urethro-rectal, prostatico-rectal, or urethro-perineal, according to the direction the pus takes.

The causes of prostatitis are in the main those of cystitis, the most common being acute urethritis, strong urethral injections, the introduction of septic instruments, or direct injury from unskilful instrumentation. *Pyæmia* is an occasional cause. The disease is not unfrequently induced by the presence of prostatic calculi.

The symptoms are, a sensation of heat and weight in the perineum and anus, severe pain of a burning character during micturition and movement of the bowels, particularly if constipated, frequency of micturition, retention of urine from swelling of the organ, and inability to sit down with comfort. There is tenderness of the perineum on pressure; the introduction of the finger into the rectum is attended by much distress, and the organ is felt enlarged, rounded, tense, and hot. If suppuration have taken place fluctuation may be felt. Constitutional disturbances with fever will be present, and rigors if suppuration has occurred. Intense pain is felt during the passage of instruments through the prostatic urethra.

The general measures of treatment are the same as in acute cystitis—rest in bed, hot baths, hot fomentations to the perineum, purgatives, light diet, and avoidance of stimulants. *Leeches* should be applied to the perineum. The urine should be drawn off by a rubber catheter should retention occur. If the symptoms do not pass off in a week or

ten days, the temperature remaining up, and particularly if throbbing in the prostatic region, accompanied by rigors, occurs, we suspect that suppuration has taken place, and our suspicions are confirmed by the fluctuation felt in the organ per rectum. The abscess should be evacuated early by the perineum.

For this purpose the patient is placed in the lithotomy position (Fig. 128), the perineum having been previously shaved and purified. The forefinger of the left hand is introduced into the rectum with the palmar surface upwards, till its tip rests on the prostate. A double-edged scalpel is then thrust into the median line of the perineum, $\frac{3}{4}$ inch in front of the anus in the direction of the tip of the finger. As soon as the knife has entered the prostate it is withdrawn, at the same time enlarging the superficial wound. Sinus forceps are introduced and the abscess tapped. The forefinger of the right hand is then introduced through the wound into the abscess cavity, the septa of which are broken down. A drainage tube is introduced and secured to the skin, and the usual dressings applied. The urethra should not be opened if possible, and the rectum should be carefully avoided.

Chronic Prostatitis.

The acute variety of prostatitis may terminate in the chronic form of the disorder, or the latter may originate as a primary disease.

The most marked symptom is the discharge of a clear or milky viscid fluid from the urethra (prostatorrhœa), and this occurs chiefly during movement of the bowels, particularly if they be constipated. The next is the presence in the urine of shreds or fine threads composed of muco-pus and epithelium. If the urine be passed in two glasses, the first portion will be turbid, and contain thin threads, the second portion

being clear. The other symptoms are : a tickling and creeping sensation in the urethra, some frequency of micturition, slight scalding in micturition, pain during the passage of instruments over the prostatic urethra, tenderness in the perineum and on introduction of the finger into the rectum, and some swelling and sponginess of the prostate. There will be undefined dull pains in the sacrum and thighs, painful erection, premature emissions, and nocturnal emissions. The disease is attended by much mental depression, sometimes amounting to melancholia, the patient imagining that the spermatic fluid is passing away, and that impotence will eventually result.

In the treatment the first thing is to remove the cause if possible. A stricture, if present, should be dealt with by one or other of the methods already described (pp. 20-58). Masturbation if indulged in must be abandoned. Constipation must be avoided by the administration of laxatives, the regulation of the diet and general habits. Counter-irritation should be applied to the perineum by means of blistering fluid on each side of the raphe alternately : alcohol should be forbidden, and sexual excitement avoided. Riding and bicycling must be given up. Tonics and change of air are indicated, as the patients are generally in bad health.

Large steel sounds should be passed beyond the prostate daily, to dilate the prostatic urethra and evacuate collections of muco-pus in the ducts of the glands. Topical applications of nitrate of silver (1 to 5 per cent.) should be made every second or third day by means of a Guyon's syringe (p. 100). I have never seen any good results from employing the urethroscope for this purpose in the prostatic portion of the canal. On the contrary, harm is done by the bruising, congestion, and bleeding produced by introducing this instrument beyond the compressor urethræ. The disgusting practice of massage of the prostate, advocated by some

surgeons in America and on the Continent, should never be had recourse to. It is useless, and has grave objections attached to its employment.

This disease is frequently very rebellious to treatment. It is the bane of the surgeon, as it is of the patient, who wanders about from one medical man to another, and eventually is, as a rule, landed in the hands of some quack.

LECTURE XIV

STONE IN THE BLADDER: ITS VARIETIES, SYMPTOMS, AND DIAGNOSIS

THIS and the lectures immediately following will be devoted to the subject of stone in the bladder—a subject which has, perhaps, in all ages been regarded as the most fascinating in surgery. Before dealing with the symptoms and diagnosis of this disease, I will direct your attention briefly to the varieties of calculi met with; and in this connexion we will examine the nature of calculi and concretions encountered in the urinary organs generally—their origin, growth, composition, numbers, conformation, and geographical distribution.

Under certain conditions the solid substances which are normally held in solution in the kidney secretion become precipitated as crystals in the uriniferous tubules, and, as a rule, pass out with the urine in the form of 'sand.' If by any chance the precipitated particles are arrested in the tubules or in any other part of the urinary tract, they grow in size by deposits of salts from the urine till they attain the magnitude of calculi. Sometimes the crystals become cemented together by mucus or other albuminoid material, and thus form the nucleus for further deposits from the urine. Even small calculi are frequently passed from the kidney and out of the urinary system, sometimes unaccompanied by pain; but more frequently attended by more or less sharp attacks of 'renal colic,' or, after reaching the bladder, by pain and other symptoms of temporary obstruc-

tion to the flow of urine through the urethra. To a calculus that passes out of the system in this way, no matter what its size, the term 'gravel' is applied. When permanently arrested in any part of the urinary tract, calculi continue to grow in bulk by constant deposits of salts from the urine, and in course of time may reach large dimensions unless removed by surgical art.

Calculi which have their origin in this way—through disorder of the constitution, and not in consequence of any previous diseased condition of the kidneys or bladder—are termed 'primary.'

Stones composed of uric acid and of the urates of soda and ammonia are the primary types most frequently encountered. Then comes the oxalate of lime calculus. Much rarer types are calculi composed of cystine and xanthine. An extremely rare form of primary calculus is one composed of indigo, derived from indican, a normal constituent of healthy urine. All these primary types of calculus are deposited from acid urine. The nuclei of most, if not all, are derived from the uriniferous tubules. Whether a primary calculus ever has its origin in the bladder by precipitation of the urinary salts in that viscus is doubtful.

The cause of the precipitation of the normal elements of the urine in the kidneys is not well understood. It is supposed to be due either to these elements being present in excess, or to a diminution in the capacity of the urine for holding them in solution. In the latter connexion it may be mentioned that the amount of urates held in suspension in urine at a certain temperature varies in direct proportion with the quantity of chloride of soda which it contains.

The precipitation of uric acid and urates is in large part dependent on disordered metabolism due to the ingestion of meat in immoderate quantities, attended with want of sufficient exercise.

Similarly, a diet in which there is an excess of certain vegetables, particularly rhubarb, tomatoes, and spinach, is supposed to favour the formation of oxalates.

'Secondary' calculi occur in connexion with suppurative changes in some part of the urinary tract, chiefly the bladder or the pelves and calyces of the kidneys, and are due to precipitation of phosphates from the urine, caused by clinical changes in it brought about by the presence of micro-organisms. This variety of calculus is usually composed of a mixture of phosphates of lime and phosphates of ammonia and magnesia. Carbonate of lime frequently enters into its composition; but the occurrence of a pure carbonate of lime calculus is extremely rare in the urinary tract.

Phosphatic calculi are always deposited from alkaline urine, the alkalinity being due to the presence of carbonate of ammonia resulting from decomposition of urea. They are of purely local formation, dependent on an unhealthy state of the urinary mucous tract. They never arise from a phosphatic diathesis. Phosphaturia may exist for years, but never give rise to the formation of a stone.

When we speak of a stone being 'uric,' 'oxalate,' etc., it must, as a rule, be understood that the prefix merely indicates the predominant ingredient: for it is rare indeed that a calculus is composed throughout of one substance only. As a rule primary calculi are composed of alternating layers of different substances, such as uric acid and oxalate of lime.

When a primary calculus excites inflammation leading to suppuration and decomposition of urine, such as pyelitis in case of renal calculus, or cystitis in case of vesical stone, the primary calculus during the existence of the suppurative process continually augments in size by the deposition on its surface of phosphates, the material of which secondary calculi are composed. Should the suppurative process disappear and the urine regain its normal acidity, urates or

oxalates will again be deposited thereon. In this manner 'mixed' calculi are produced.

The physical characteristics of individual calculi are as follows:

1. The *uric acid* stone (Fig. 103) is generally ovoid and flattened, smooth or faintly nodular, yellowish or reddish brown, hard and heavy. On section it is laminated. It usually occurs singly, but may be multiple, and then the calculi are frequently more or less faceted.



FIG. 103.

2. Calculi composed of the *mixed urates* (urates of soda, ammonia, calcium, and magnesia) are very similar to that above described, except that they are lighter in colour and denser in structure, and therefore more difficult to crush. The ordinary red sand or gravel passed by gouty patients is composed of urates.

3. The *oxalate of lime* calculus (Fig. 104) is generally found single. It is almost invariably rounded, covered by rough nodules and frequently by long, sharp spines. It is intensely hard and heavy, of dark brown colour, or even black, owing to pigmentation from blood. Owing to its nodular form and dark colour it is known as 'mulberry' calculus. It is of very slow growth, and so hard that it is difficult to crush.

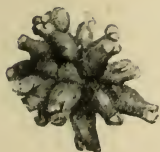


FIG. 104.

4. *Phosphatic* calculi are white or greyish white, and of chalky appearance, friable, and emit an offensive ammoniacal odour. When single they are of irregular shape and rough on the surface (Fig. 105); but when multiple, as they frequently

are, they are smooth and faceted, forming cubes or pyramids (Fig. 57). When composed of phosphate of lime and the triple phosphates (soda, ammonia, and magnesia) in the proportion of about one of the former to two of the latter, they are termed

'fusible' calculi, owing to the fact that the stone fuses to a bead when placed in the flame of a blow-pipe. Phosphatic calculi are, as a rule, soft like chalk, but when composed mainly of phosphate of lime (bone earth) they may be very hard.

These calculi are mainly found in connexion with obstructive disease, such as enlarged prostate and stricture of the urethra. They are usually formed round a nucleus composed of inspissated mucus or blood-clot; not unfrequently the

nucleus is a foreign body, such as a piece of catheter in the male. In females I have found as nuclei a slate pencil, a hairpin, and a small button-hook. In Egypt the ova of the *Bilharzia hæmatobia* frequently form the nuclei of phosphatic calculi.

5. The *cystine* calculus is oval in shape, soft, light, translucent, and waxy in appearance. Amber-coloured when freshly removed, it turns a greenish-yellow when exposed to air.

6. *Xanthine* calculi are oval or rounded, and reddish in colour.

Calculi situated partly in the bladder and partly in the prostatic urethra are of very irregular form, sometimes assuming grotesque shapes (Fig. 106). They are usually constricted about the middle, owing to the action of the sphincter of the bladder.

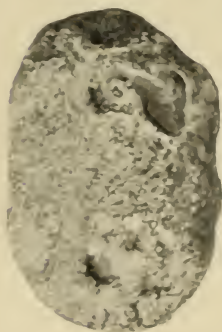


FIG. 105.



FIG. 106.

Vesical calculi of the urate type are most frequent. Next come the phosphatic calculi, and then the oxalates. Cystine and other varieties are very rare. In my own practice, amongst 1,361 vesical calculi removed by me there were only 3 composed purely of cystine. Of these operations 868 were performed during my Indian experience, and the percentages of the different varieties of stone were in round numbers: urates, 64; phosphates, 16; oxalates of lime, 8; mixed, 12. In England I have removed 493 vesical calculi, the percentages being: urates, 46; phosphates, 35; oxalates, 7; mixed, 12. I find that in connexion with 452 cases of prostatectomy there were calculi present and removed at the same time in 85 instances, of which 61 per cent. were phosphatic. These figures must, however, be regarded as only approximately correct, as only a rough physical examination of most of the calculi has been made. I have no doubt that a very large proportion of the calculi removed in India would prove on detailed examination to have oxalate of lime nuclei.

Vesical calculus is much less common in the female than in the male, owing to the comparative ease with which stones when small pass out through the short and dilatable urethra of the female. Thus, in my own practice, amongst 1,361 operations for vesical stone, there were only 31 operations in females, or 2·28 per cent.

No age is exempt from this disease. Primary or systemic calculus is common amongst the children of the poor, but extremely rare amongst those of persons living in easy circumstances. The want of a proper supply of milk in the case of the former is the cause assigned for this unequal distribution in infancy and childhood. On the other hand, the disease is much more prevalent in adult and old age amongst the wealthy, who live an idle life and indulge in the good things of the table, than amongst those who live an active and laborious life and who eat sparingly. Phosphatic

(secondary or local) calculus resulting from prostatic enlargement and other obstructive causes is equally common in both.

Heredity undoubtedly plays an important part in the production of stone.

In the vast majority of cases there is only one stone present, but it may be multiple, and in some cases even more than one hundred calculi are found. Phosphatic calculus is more frequently found multiple than the other varieties.

A trustworthy account of the geographical distribution of stone would be interesting, and probably of much assistance in adding to our imperfect knowledge of its causation; but this has still to be written. The disease is much more prevalent in certain areas than in others. In England stone is more common in the eastern counties, particularly Norfolk, than elsewhere. In India the disease is very prevalent in the Punjab, the northern portions of the United Provinces, and the northern parts of Bombay (Sindh and Guzerat)—that is, mainly in the alluvial plains watered by the Indus and upper part of the Ganges with their tributaries; whilst it is comparatively rare in the Madras Presidency and other parts. In an address delivered by me at the annual meeting of the British Medical Association in 1901 (*vide British Medical Journal*, 1901, p. 673), I showed from the statistics of Indian hospitals for 1899 that amongst every million of inhabitants in the Punjab there were 111 operations for vesical calculus in that year, whereas in Madras the proportion was only $1\frac{1}{2}$ per million, so that the disease would seem to be 83 times more common in the Punjab than in Madras.

The only features common to the stone-producing area are: (1) the excessive presence of lime salts in the water, and (2) intense dry heat for several months in the year, leading to great concentration of the urine and consequent liability

to the deposit of its saline constituents; whereas these conditions are absent in those parts of the country in which stone is rare. It is not improbable that either or both of these conditions may influence the formation of calculi. But the causation of stone is such an extremely abstruse problem, surrounded by many anomalies, that with our imperfect knowledge dogmatism in this matter is out of place.

Symptoms.

The classical symptoms of stone in the bladder are four in number: (1) Increased frequency of micturition; (2) pain in connexion with the act of urination; (3) hæmaturia; and (4) sudden stoppage of the flow of urine.

If a patient suffers from these four symptoms you should at once suspect the presence of a stone in the bladder. If, in addition, you ascertain that previous to the setting in of these symptoms the patient had passed one or more small calculi, possibly preceded by attacks of renal colic, your suspicion will grow into a practical certainty that there is a stone in the bladder. If the symptoms have existed for a lengthened period you will probably find that the urine contains pus and mucus, due to the cystitis set up by the presence of the stone. It must be remembered, however, that a urate, or even an oxalate, of lime stone may exist for years in the bladder without causing cystitis, in which case the urine would be clear and acid. A phosphatic calculus is invariably attended by pus and mucus in the urine.

A stone may be found with any three of these symptoms, any two, or even any one of them. A large calculus may even be present in the bladder and give rise to none of these symptoms. This urate stone which I show you, the débris of which weighs 3 ounces, I removed successfully by litholapaxy from a young man of twenty, and he assured me that

till six months before coming under my care he had been troubled by no urinary symptom. Still, this calculus did not grow in six months; it was the product of years, so that the patient must have carried it about in his bladder for a lengthened period without any inconvenience.

On the other hand, very similar symptoms to those I have indicated may exist and no calculus be present, simply from the fact that these symptoms may be produced by some other disease than stone. Let us, therefore, examine these four symptoms individually, and see what are the peculiar characteristics of each of them when due to stone.

1. Increased frequency of micturition is the earliest, as it is the most constant, symptom of stone. The bladder becomes irritable—frets, as it were—at the presence of its unwelcome and unnatural tenant. This, like most of the symptoms of stone, is aggravated by exercise and diminished by rest. Consequently it is less frequent at night, when the patient is lying down, than in the day, when he is going about—exactly the reverse of what occurs with enlarged prostate—a point of diagnostic importance, as we have previously seen.

2. The pain which is almost invariably present with stone is, strange to say, rarely referred to the bladder itself. It is reflex in character, and situated near the end of the penis, at the posterior aspect of the glans, most frequently in the position of the frænum. It occurs, as a rule, in connexion with the act of micturition, setting in, and gradually increasing in intensity towards the end of the act, as the bare walls of the bladder come in contact with the stone; and it gradually disappears as the bladder refills, the urine acting as a buffer between the stone and the bladder walls. But any form of exercise, such as walking, riding, or jolting in a carriage over rough roads, will bring on the pain. It is described variously by different individuals as of a scalding, aching, or lancinating character. A patient of mine once

described it as a sensation as if the penis was being broken off. The pain diminishes in intensity as life advances, being much more excruciating in children than in aged persons. There is nothing more heart-rending to behold than the suffering of a little child afflicted with stone, as he dances about the floor during and after micturition, shrieking with agony, and pulling at his foreskin (which becomes elongated and probably ulcerated), trying to relieve the pain.

3. The hæmaturia attendant on stone, though neither the earliest nor the most distressing symptom, is that which usually most alarms the patient and induces him to seek medical advice. It presents three characteristics: (1) It comes on gradually, sudden or profuse hæmorrhage not being indicative of stone; (2) it generally occurs towards the end of micturition, the earlier portions of the stream being clear, the later portions being tinged with blood, and winding up with a few drops of pure bright blood; (3) exercise increases, and rest diminishes, the liability to its occurrence. After active exercise the urine will, as a rule, be uniformly tinged with blood.

4. Stoppage of the flow of urine is the least common of these symptoms, and is due to the stone falling against, or plugging, the inner orifice of the urethra. It is much more common in the earlier than in the later stages of stone, whilst the latter is still small.

Such, then, are the characteristic features of each of these four symptoms of stone. There are, however, as I have already said, many other diseases of the urinary tract which present somewhat similar symptoms. Let us examine these latter and see what peculiarities they possess which will help us towards a

Diagnosis.

1. Increased frequency of micturition by itself, apart from one or more of the other symptoms described, is of little

diagnostic importance. It may occur with almost any disease of the urinary tract; and indeed, in perfect health, under the influence of certain drugs, the ingestion of various kinds of food and drink, or with the sudden setting in of cold or damp weather, owing to the increased work thrown on the kidneys from the action of the skin being checked. It is when taken in conjunction with one or more of the other symptoms that it is of consequence as a diagnostic feature of stone in the bladder.

Vesical calculus, as we have just seen, is extremely rare in females as compared with males. But two of the symptoms of stone—viz., increased frequency of micturition and pain—are very common in women. These two symptoms are in the great majority of cases due to some flexion, enlargement, or inflammatory state of the womb, causing pressure on the bladder. Vascular caruncle of the urethra is also a not uncommon cause of these symptoms.

2. The reflex pain referred to the end of the penis, already described, used to be regarded as pathognomonic of vesical calculus; but recent observations, and particularly the extended use of the cystoscope, have shown that it occasionally occurs in connexion with other conditions—viz., stricture of the urethra, enlarged prostate, tubercle or calculus in the prostate, local cystitis, ulcer of the bladder, or pendulous tumour falling against the neck of the bladder, clots of blood or thick tenacious mucus lying at the inner orifice of the urethra and obstructing the passage; also, though rarer, stone in the ureter or pelvis of the kidney.

The pain attendant on stricture, when it does occur, accompanies the act of micturition and is felt at the seat of the stricture; the pain in connexion with enlarged prostate precedes the act, and is, as a rule, referred to the hypogastric region; while the pain of vesical calculus follows the act of urination, and is felt behind the glans.

For the further diagnosis of stone from enlarged prostate you will have the advanced age of the patient in the latter disease, the frequency of micturition greater at night than in the daytime, and the rectal conditions on examination, to guide you. It must be remembered, however, that the two diseases frequently coexist, stone being, as we have already seen, very common in prostatic patients. When much irritability of the bladder, pain during micturition, and hæmaturia occur in such a patient the presence of stone should be suspected.

3. Hæmorrhage between the acts of micturition must come either from the urethra or prostate, usually the latter.

In tumours of the bladder the hæmorrhage is more profuse than with stone, and painless, as a rule; the urine is uniformly mixed with blood, and contains large irregular clots, and, perhaps, portions of tumour débris, visible by the microscope or even to the naked eye.

The hæmaturia of tuberculosis of the bladder much resembles that of stone, but the family history and the possible coexistence of tubercle in other organs will, as a rule, help us to a diagnosis. There is no other disease the symptoms of which so nearly resemble those of stone as tubercle of the bladder; and it will frequently be impossible to diagnose between them without the aid of the sound or cystoscope.

‘Endemic hæmaturia,’ due to the presence of the *Bilharzia hæmatobia*, is, as a rule, painless, though occasionally cystitis accompanies it. The cause of the bleeding will be suspected when the patient has lived in a country where the bilharzia abounds—namely, Egypt, Abyssinia, Natal, and the Cape. Diagnosis is confirmed by the cystoscope, or when the ova are found in the urine by the microscope.

In hæmorrhage from the kidney the urine is uniformly mixed with blood, frequently smoky or porter-like in colour,

and often contains dark vermiform clots—the casts of the ureters.

4. Sudden stoppage of the flow of urine may also be caused by a pendulous tumour of the bladder or prostate dropping against the inner orifice of the urethra, by a foreign body, clot of blood, lump of thick inspissated muco-pus, or débris of growth. This symptom may also be due to the prolapsed lower end of a ureter containing a stone. I have met with several instances of this kind, and one in particular, where, to overcome the difficulty caused by the prolapsed ureter plugging the urethral orifice, the patient had to lie down before he could micturate, or to pass a catheter.

Having thus analyzed the characters of the various symptoms, and having come to the conclusion that the weight of evidence points to the presence of stone, you will proceed to sound the patient to confirm your diagnosis. But no matter how strongly the symptoms point in this direction, you should on no account give a definite diagnosis till the stone has been felt, or seen by the cystoscope.

A patient is best sounded when lying on a high couch. He lies on his back, with his head on a pillow, his lower limbs being flexed and slightly abducted. The bladder should contain two or three ounces of fluid; if it be empty this quantity of warm boracic solution should be slowly introduced through a soft catheter. As a rule, in the adult an anæsthetic will be unnecessary, but it should always be employed in children, and it will sometimes be necessary in the adult, particularly in prostatic patients.

I show you here several kinds of sounds. There is nothing superior to the simple solid steel sound, known as Mercier's (Fig. 107), with its short, well-curved beak and bulbous end. That which I generally employ in adults is No. 6 of the English scale in the shaft and 10 in the bulb; for children, No. 3 in the shaft and 5 at the bulb. Another useful form of

sound is that employed by the late Sir Henry Thompson (Fig. 108). The cylindrical enlargement on the handle increases the tactile sensation, and, being hollow, fluid can be withdrawn from, or injected into, the bladder without removing the sound.

Standing on the right side of the patient, you hold the sound — previously sterilized, warmed, and lubricated —

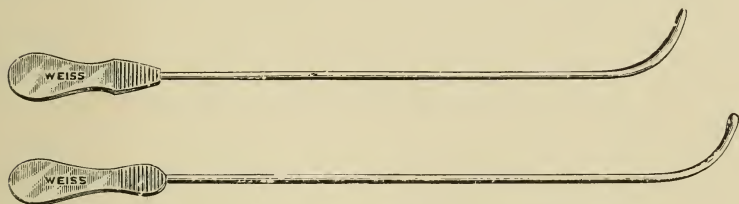


FIG. 107.

horizontally by the right hand, and insert its beak through the meatus, pulling the penis slowly on to it by the fingers of the left hand. The sound is gradually elevated, as it slides down the urethra, to the vertical position. By gently depressing its handle between the thighs the beak will be found to slip along the membranous and prostatic portions of the canal and into the bladder. In a large proportion of



FIG. 108.

cases, if a stone be present, it will at once be recognized by the grating sensation elicited as the sound enters the bladder, for the stone generally lies close to the inner orifice of the urethra. If not, the beak is pushed on to the distal part of the fundus, and then, as it is slowly withdrawn to the neck of the bladder, it is rapidly but lightly rotated in a half-circle, so that its point taps the bladder walls, on either side.

This process may be repeated several times. We should be careful at this stage, particularly in children, not to mistake the bony ischial spine for a stone. The handle is now depressed between the thighs, and the beak rotated downwards, and gradually withdrawn with a rotatory motion from side to side towards the neck, thus searching the floor of the bladder immediately behind the prostate. Every part of the bladder is searched in this methodical manner. Finally, the sound is held almost perpendicularly, with its beak resting on the trigone. It is then lifted slightly off the base of the bladder, and the beak shaken rapidly but lightly from side to side. By this manœuvre I have frequently detected the faint grating or tinkling of a tiny stone which would otherwise have passed unobserved.

In women it will sometimes be found that the bladder is divided into two lateral cavities by a median ridge produced by pressure of an enlarged womb from behind—saddle-bag shaped, in fact. The beak of the sound must be directed first into one and then into the other of these cavities, which should be methodically searched.

It will be found, however, that in the most experienced hands a small stone lying in some peculiar position—such as in a depression behind an enlarged prostate, in a cyst, between the folds of a rugose bladder, or when covered by thick adherent muco-pus—will sometimes evade detection. The discovery of these small calculi, before they grow into large ones, is of vital importance, as their removal by the lithotrite is practically unattended by danger.

In the *Indian Medical Gazette* of March, 1884, I drew the attention of the profession to a new method of diagnosis for small calculi by means of the aspirator and cannula employed in Bigelow's operation. The largest cannula (Fig. 120) that will pass into the bladder with ease is introduced, and the aspirator (Fig. 125) applied. Water is then pumped into the

bladder and exhausted, the process being repeated again and again, whilst the eye of the cannula is moved about in various positions and directions, so as to explore every nook and cranny of the viscus. If a small stone be present it will almost with certainty be drawn with force to the eye of the cannula, and its presence will be revealed by the click or tinkling sound produced by its impact against the metal tube. Further, if the stone be a small one, it may pass through the cannula into the glass receiver, without the necessity of crushing it. This method of diagnosis will be fully understood later on, when the operation of litholapaxy has been described. It was first suggested to me by the sounds produced by the fragments clicking against the eye of the cannula during the operation. I have since diagnosed many calculi by this simple method when all others have failed. Its practical advantages were at once recognized by many distinguished surgeons, particularly by my colleague, Mr. Reginald Harrison, in his published writings, and it is now generally employed.

When, however, a stone is fixed in position, whether in a narrow-mouthed sac, wedged in between the prostate and the bladder wall, or sticking in the urethral orifice—as a stone occasionally is in its passage from the kidney—even this method of diagnosis may fail. In obscure cases of this kind the cystoscope, which has proved of such inestimable value in the diagnosis of tumours and other obscure diseases of the bladder, will probably reveal the presence of the stone.

Finally, when all these methods of diagnosis fail to verify the presence of a stone, and the symptoms persist, it may be advisable to open the bladder either perineally or suprapubically to ascertain their cause. The latter method will, as a rule, be the preferable one, as it enables us to both feel and see the conditions existing inside the bladder, and at once to remove the cause of the symptoms.

LECTURE XV

OPERATIONS FOR REMOVAL OF STONE IN THE BLADDER

HAVING definitely ascertained the presence of stone in the bladder in the manner described in the previous lecture, the next question for consideration is the method of removing it.

From time immemorial various drugs and nostrums have been introduced and vaunted as solvents for stone, whether by internal administration or by injection into the bladder; but all efforts in this direction have hitherto proved fruitless.

There is only one means by which stone can be removed—namely, surgical operation. Two entirely different methods of operating are in vogue, which for long held the field as rivals, but are now regarded as supplementary to each other—(1) lithotomy, in which the stone is removed by a cutting operation, and (2) litholapaxy, or Bigelow's operation, by which the stone is crushed into fine débris and removed through the urethra without the employment of the knife. The latter of these is the method of choice, and that which should be practised in the vast majority of instances. I will therefore deal with it first.

Litholapaxy.

Though cutting operations of various kinds for stone have been practised from the earliest ages, it was not till the beginning of the present century that the idea of removing a stone by pulverizing it within the bladder, and allowing the débris to escape by the natural passages, was entertained.

The first to crush a stone on scientific principles was the great French surgeon, Civiale, in 1824. This he effected by the 'trilabe,' a species of drill consisting of a central axis and three claws, which, after introduction of the instrument into the bladder through the urethra, were made to project and catch the stone. The reduction of the stone to fragments was effected by drilling holes in it in various directions till it crumbled into *débris*. The operation, which he named 'lithotrity,' extended over several sittings, the fragments passing away naturally with the urine. It will be observed that the disintegration of the stone was accomplished by a drilling rather than by a crushing process. Shortly afterwards a great improvement was effected by Weiss, of London. He constructed an instrument by which the stone was grasped between two short blades, bent at an angle with the shaft, and reduced to fragments by a true crushing process. And, though various improvements have since been effected, it may be said that this is the model on which all modern lithotrites are constructed.

In the development of the lithotrite, various changes have been made in the method of applying the motive power by which the stone is crushed between the blades. Thus, in Heurteloup's time, the patient was placed in a peculiar-shaped bed, to which a vice was attached. After the lithotrite was introduced into the bladder, and the stone grasped between its jaws, it was fixed in the vice, and the stone reduced to *débris* by blows of a hammer applied outside. Some time after, a great improvement was effected in the introduction of the screwing process by Hodgson, of Birmingham. Sir William Fergusson advocated the rack-and-pinion system in the lithotrite; but the screwing process is that now generally adopted. Lastly, Sir Henry Thompson adapted the cylindrical handle to the lithotrite; and this, combined with Weiss's method, by which the sliding action may be con-

verted into a screwing one, is now generally employed in the construction of modern lithotrites.

Turning aside temporarily from the instruments, let us glance at the principles involved in the operation. As already mentioned, Civiale's practice was to crush small quantities of stone at repeated sittings, each extending over a few minutes only, the detritus coming away by natural efforts with the

urine. From time to time, however, attempts were made to assist Nature in getting rid of the débris by artificial means. For this purpose currents of water, injected into the bladder through a large catheter from a syringe, were employed by Heurteloup and others. In 1846 Sir Philip Crampton, of Dublin, invented a suction apparatus resembling a large soda-water bottle with a tap at the neck, which was exhausted of air, and then applied to a catheter previously introduced into the bladder, and, in this way, an attempt was made to get rid of the fragments. Subsequently Clover designed his syringe (Fig. 109), which consisted of an indiarubber bulb



$\frac{1}{3}$ SCALE

FIG. 109.

with a glass receiver, from which water was pumped into, and withdrawn from, the bladder through a catheter, No. 12 or 13, English scale; and in this way a certain quantity of sand was brought away. Then, again, Sir William Fergusson endeavoured to complete the operation at one sitting by withdrawing the fragments through the urethra by means of long and slender lithotrites. Sir Henry Thompson, though apparently adverse to this method at first,* sub-

* 'Lectures delivered at the College of Surgeons, England, 1884,' by Sir H. Thompson, p. 117.

sequently employed it for a time.* But it came to be regarded by the profession as a very dangerous process, often inflicting severe injury on the urethra.

All these methods of artificial evacuation of débris were invented with a view to obviate the recognized danger of allowing rough and sharp fragments of stone to remain in the bladder—a common cause of cystitis. Each method enjoyed a temporary though transient notoriety; but they one and all fell into disrepute, for the simple reason that they failed to accomplish the object at which they aimed, and, at the same time, caused a great deal of irritation. And the practice which Civiale had inculcated—of short and frequent sittings, the débris being allowed to come away by natural efforts—came eventually to be recognized, by universal consensus of opinion amongst the profession, as the most safe and judicious.

Such was the position of lithotritry in 1878, when Bigelow appeared on the scene with his new operation, and proposed to revolutionize the whole system by crushing and evacuating the stone at one sitting, no matter how prolonged, and no matter how large the stone might be, provided only that it was capable of being grasped and crushed by the large lithotrites then introduced.

Bigelow's operation practically resolves itself into two proceedings—the reduction of the stone to fragments, and the evacuation of the débris from the bladder.

The crushing of the stone is accomplished by means of

* 'Lithotritry at One or More Sitzings' (*Lancet*, vol. i., 1879, p. 145).

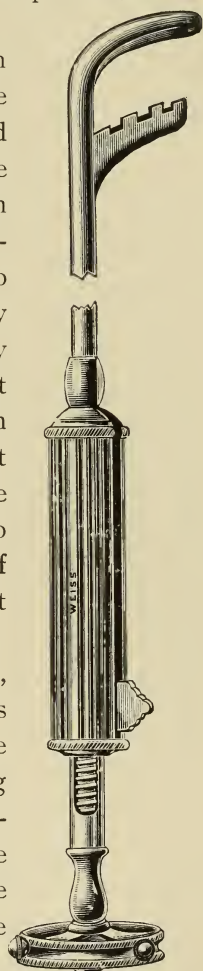


FIG. 110.

lithotrites, similar to those employed for the old operation of lithotrity, except that, owing to the increased scope of the new operation in dealing with large and hard calculi, some of the lithotrites employed for adults are constructed much larger and stronger than those formerly in use. On the other hand, owing to the more recent extension of the modern operation to male children of the most tender ages, extremely small and slender lithotrites are now employed. In Fig. 110 is illustrated a lithotrite constructed on the well-known model of Weiss and Thompson. It possesses the cylindrical handle introduced by Sir Henry Thompson, which (in the words of the inventor) 'enables you, in the search for a small stone or fragments, to execute rapid and delicate movements which would be impossible in an instrument without the cylindrical handle.' It also possesses the new mode of changing sliding into screwing action, and *vice versa*, introduced by Weiss. When the small button in front of the cylinder is pushed back into the position indicated in the illustration, the instrument is 'locked,' and then the male blade moves within the female blade by a screwing action only; but when the button is pushed forward in the direction of the blades, the instrument is 'unlocked,' and the screwing is converted into a sliding action.

For the operation of litholapaxy, three varieties of this instrument were commonly employed: (1) A fully fenestrated lithotrite (Fig. 111) for crushing large and hard stones. The male blade, which is deeply serrated or toothed, passes through the female blade, driving the débris through the opening in the latter, or tossing it away on either side, so that no blocking of the blades by fragments can occur. (2) A flat-bladed, non-fenestrated lithotrite (Figs. 112, 113), which was used for reducing fragments into fine powder, after the coarse work of breaking up the stone had been effected by means of the fenestrated instruments. (3) A partially

fenestrated lithotrite (Figs. 114, 115), with an opening in the heel of the female blade, used for the same purpose as the latter, and also to crush small and medium-sized calculi.

For some years after I began to practise litholapaxy I used these non-fenestrated and partially fenestrated instruments a good deal; but I gradually came to abandon them, and now use none but fully fenestrated lithotrites in my practice.

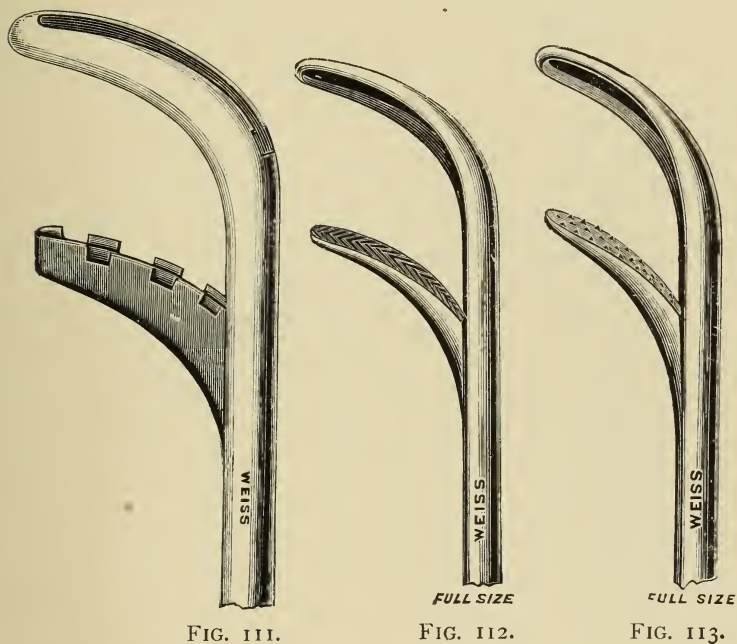


FIG. 111.

FIG. 112.

FIG. 113.

I consider the use of any other kind unnecessary and unjustifiable, considering the danger that exists of *débris* getting impacted in the jaws of non-fenestrated instruments, an accident which cannot occur with fully-fenestrated ones when properly used. The use of the lithotrite in the modern operation is to *crush*, never to *fish out*, the fragments, a rôle to which, as we have seen, it was frequently consigned in the old operation of lithotrity. Indeed, I cannot conceive any

circumstances in which it would be advisable to use a non-fenestrated lithotrite in the modern operation.

Sir Henry Thompson wrote:* 'A collateral advantage of this flat-bladed instrument is, that it will hold a good deal of débris without undue augmentation of its size, so that not a

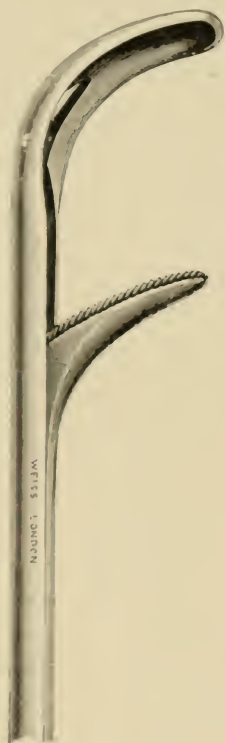


FIG. 114.

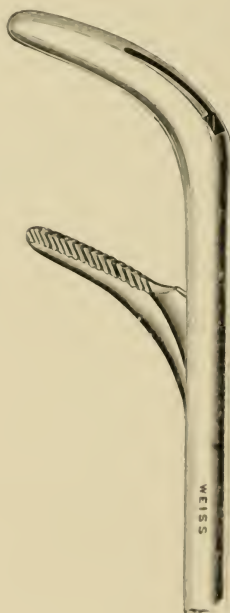


FIG. 115.

little can be safely brought away by the urethra, if desired, whenever the instrument is withdrawn.' In writing thus, four years after Bigelow's operation was introduced, Sir Henry evidently confounded the old and new operations. 'We should,' as Bigelow says, 'distinctly recognize that what

* 'Diseases of Urinary Organs,' sixth edition, 1882, p. 78.

can be withdrawn in a lithotrite could come better through a tube, and that the only province of the lithotrite should be to pulverize, or, indeed, merely comminute, and not to evacuate.'

In Bigelow's lithotrite (Fig. 116), the cylindrical handle of Thompson's instrument is retained for the left hand; but instead of the wheel for the right hand a ball is substituted. This is an undoubted improvement, affording a much firmer purchase, a point of great importance when dealing with a large and hard calculus. But the special feature of Bigelow's lithotrite is the introduction of a new mode of locking the instrument. This is effected simply by a quarter rotation of the right wrist, whilst the hands are in position, without any displacement of the fingers; whilst a quarter rotation of the wrist in the opposite direction unlocks the instrument. In the lithotrite of Weiss and Thompson, the thumb of either hand has to be disengaged to move the button, a performance which tends to render the lithotrite in the bladder unsteady at the critical moment of catching the stone. By the ingenious device of Bigelow this objection is obviated—a decided improvement. On the whole, the movements of this lithotrite are easier and more graceful than in any instrument I have ever worked with. So much for the handle of Bigelow's lithotrite.

I cannot say, however, that I like the blades

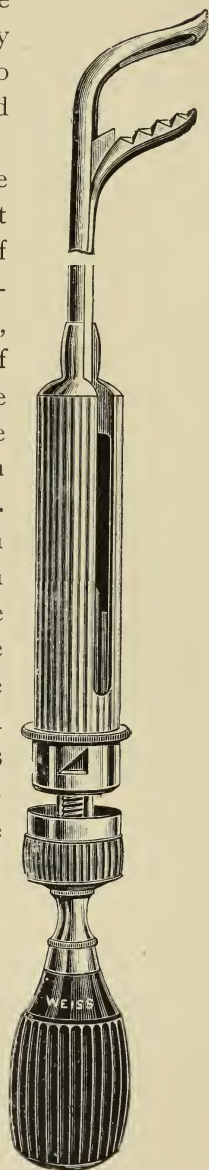


FIG. 116.

the fenestrated lithotrites by Weiss and Thompson already described. The blades (Fig. 117) of this lithotrite consist of a shoe, or female blade, the sides of which are so low that a fragment falls upon it; while the male blade, or stamp, offers a series of alternate triangular notches, by whose inclined planes the detritus escapes laterally after being crushed against the floor and rim of the shoe. At the heel of the shoe, where most of the stone is usually comminuted, and where the impact is therefore greatest, the floor is high

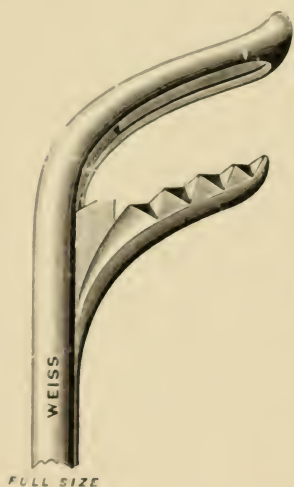


FIG. 117.

and discharges itself laterally, while its customary slot is made to work effectually' (Bigelow). The blades are essentially non-fenestrated, and liable to get clogged with débris, as I have frequently found in practice, and, therefore, objectionable.

In 1886 I had constructed for me by Weiss a lithotrite (Fig. 118), in which the handle and locking action of Bigelow are combined with the fenestrated blades of Weiss and Thompson. The female blade is completely fenestrated, the male blade passing right through, so that when closed their under surfaces are flush with each other, and thus all fear of impaction of fragments is avoided. The upper edges of the female blade are smooth, and bevelled on their inner aspect, so that there is much less chance, in unpractised hands, of the mucous membrane of the bladder getting nipped between the blades than in those lithotrites in which the upper edges of the female blade are toothed. Over twenty years' acquaintance with this lithotrite enables me to say that it is practically perfect in its working, and

it is the model on which my lithotrites have since been constructed.

The second object aimed at in the operation, the removal of the débris from the bladder, is accomplished by means of large cylindrical tubes, or evacuating catheters, introduced through the urethra, and an aspirator, or suction apparatus, attached thereto.

Some time before the introduction of Bigelow's operation, it had been demonstrated by Otis, of New York, that the urethra in the adult male is much more capacious than had previously been imagined, and this discovery undoubtedly paved the way towards the development of the new operation.

The cannulæ employed vary in size according to the capacity of the urethra, Nos. $4\frac{1}{2}$ to 11, English scale, being used for male children, and Nos. 12 to 18 for adults and females of all ages. In my own practice I have not found it necessary to use a larger cannula than No. 18, and through a tube of this calibre I have removed the débris of a calculus weighing $6\frac{1}{4}$ ounces. I have, however, met with cases in which a No. 19 or 20 cannula might have been passed with facility. Cannulæ are made of thin silver, and vary in shape, some being straight, and some slightly curved at the extremity (Figs. 119, 120). The latter I prefer, as I find them more easy of introduction. The orifice, or eye, should be large enough to admit any fragment that will pass through the tube. The cannulæ should be armed with stylets (Fig. 120) for reasons that will appear later on.

Though the evacuating catheters remain much the same



FIG. 118.

now as on their introduction by the originator, several modifications have been effected in the aspirator; and these I shall now describe, indicating the varieties of aspirator that I have found most effective.



FIG. 119.

FIG. 120.



FIG. 121.

The original aspirator of Bigelow is represented in Fig. 121. It consists of an elastic bulb or central portion, to the lower extremity of which is attached a removable cylindrical glass receiver: whilst from its upper part passes an indiarubber tube, the end of which fits on to the evacuating catheter

previously introduced into the bladder. By alternate compression and expansion of the bulb, the water is pumped into, and withdrawn from, the bladder, and the débris, which is carried back into the aspirator, falls down into the glass receiver, and is there retained.

The next form of Bigelow's aspirator is represented in

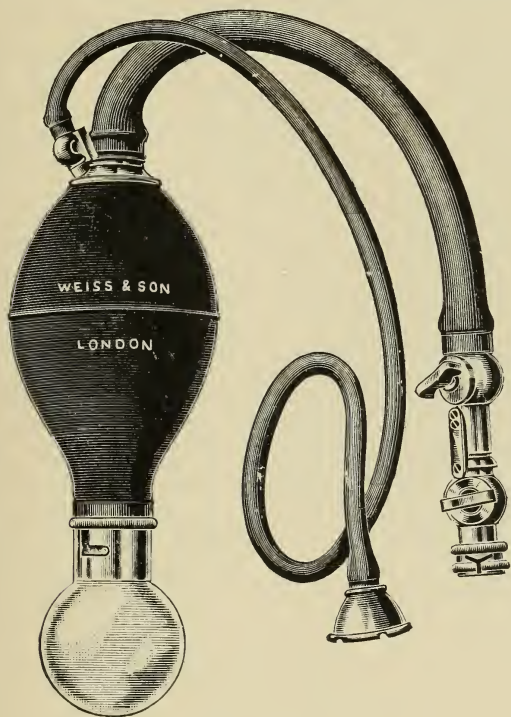


FIG. 122.

Fig. 122, to which is added an elastic tube or hose, provided with a stop-cock close to its junction with the bulb. By this hose water can be introduced into the aspirator from a neighbouring vessel without disturbing the apparatus. There is also an extra stop-cock for the evacuating catheter.

In Bigelow's more recent aspirator (Fig. 123), the long

flexible elastic tube intervening between the bulb and the evacuating catheter is dispensed with, the catheter fitting into a brass tube, provided with a tap, inserted into the side of the bulb, near the glass receiver. The distance between the bladder and the aspirator is thus much shortened. At

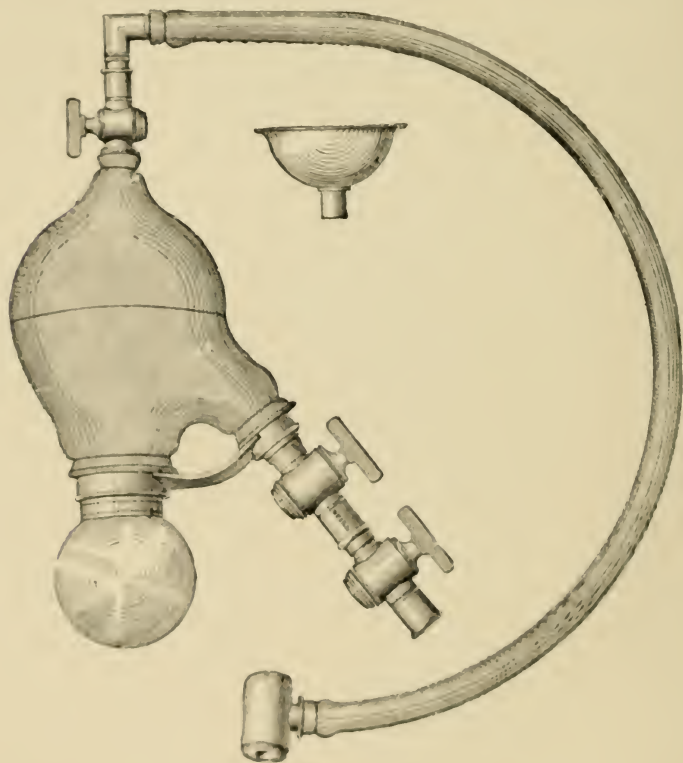


FIG. 123.

the upper part of the bulb is a tap by which air escapes, and is excluded from the apparatus when filled with water. A feature of the new aspirator was the introduction of a strainer (not shown in the woodcut) for preventing the return of débris from the receiver into the bladder. This strainer was formed by a prolongation within the bulb of the brass tube,

which fits on to the catheter in the form of a perforated cylinder.

In practice I soon found that the extra stop-cock and hose were not essential, and that the rough surface of the perforated strainer impeded the free flow of débris from the bladder into the receiver. In fact, the strainer in this form of aspirator is superfluous, as fragments of stone that once pass into the receiver cannot return into the bladder. These appendages are dispensed with in the modification of Bigelow's aspirator represented in Fig. 124, with which I worked for several years, and which I found very efficient.

In 1895 I had this latter aspirator simplified still further by dispensing with the tap above the rubber bulb, which was not really necessary, as the apparatus can be easily filled through the front tap, to which the cannula fits. This may

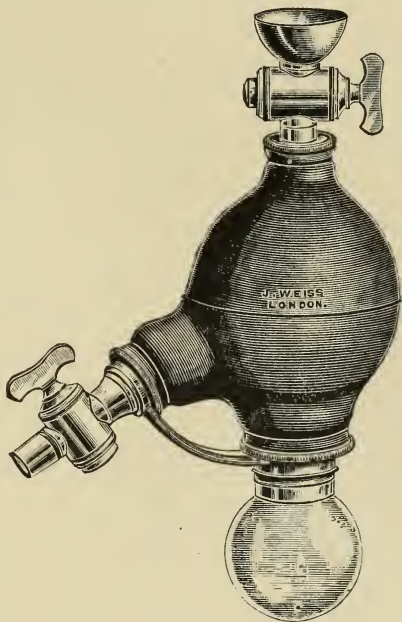


FIG. 124.

be effected still more rapidly by removing the glass receiver from the bulb, immersing both in a basin full of fluid, and then attaching the glass receiver to the bulb whilst the whole apparatus is completely immersed in the fluid. In this way all air is excluded.

This modification of Bigelow's aspirator (Fig. 125) I consider the simplest, handiest, and most practical that has yet appeared. It is so light and well-balanced that it can be

worked by one hand, leaving the other free for the manipulation of the cannula. I have employed it now continuously for some eleven years, and find it thoroughly efficient in all respects.

There are many other modifications of Bigelow's aspirator



FIG. 125.

in the market, some of them efficient, others unnecessarily complicated. In fact, there are few surgeons who practise urinary surgery that have not devised aspirators to their own liking. It is unnecessary to describe them here, as that which I have just referred to (Fig. 125) is thoroughly practical in its working.

LECTURE XVI

THE OPERATION OF LITHOLAPAXY

HAVING in the previous lecture given a sketch of the special instruments employed in the operation of litholapaxy, I will now proceed to describe in detail the various stages of the operation. I will assume that a stone of moderate size has been diagnosed in an adult, and its presence confirmed by the sound.

It will be well in all cases to submit the patient to preliminary treatment for a few days previous to undertaking the operation. The patient should be put to bed and placed on a light, nourishing diet. The bowels should be regulated, a purgative, such as castor-oil, being given should constipation exist, and mild astringents should the patient suffer from diarrhœa, which is often the case. Barley-water, with alkalies and tincture of hyoscyamus, should be given if there be much irritation of the bladder with acidity of the urine.

For the operation, I find a low, narrow, operating-table the most convenient. The patient is placed on this, close to the right edge, with his head resting on a pillow. The buttocks are raised by means of a low cushion placed beneath them. This is an important point, as the stone thus gravitates to the base of the bladder, away from the neck, and renders the latter part, which is the most sensitive, less

likely to be injured in the various manipulations. The legs and thighs are flexed and slightly abducted.

In the cold weather it is very essential that the patient should be protected by warm clothing during the operation, to prevent chill. For this purpose a pair of large woollen stockings should be slipped on, reaching right up the thighs close to the groins. Such a pair of stockings can be made loosely out of an old blanket. In addition to the ordinary clothing, a light blanket should be thrown over the chest.

Close to the operator's right hand should be placed a small table, with a tray or basin containing warm carbolic lotion, in which the lithotrites and evacuating catheters should be placed ready for use; while the aspirator, previously filled with warm boracic lotion, should be entrusted to an assistant conversant with its working. It is well, when possible, to have two or three aspirators ready at hand, to be used alternately. The operation is thus facilitated, as while the surgeon is using one, a second can be emptied of débris and refilled with water by the assistant.

A small cup containing oil should be at hand for lubricating the instruments. In this operation too much oil cannot be used, the instruments being well lubricated at each introduction.

Before undertaking the operation of litholapaxy the surgeon must learn to pass all instruments—lithotrites, sounds, and catheters—on the right side. This requires only a little practice to do it with ease, and much time is saved thereby. Besides the loss of time involved, it is extremely awkward to see a surgeon passing the instruments on the patient's left side, and then going round to the right side to use them.

The patient now being, as a rule, anæsthetized, the surgeon, standing on his right side, should first pass a large conical steel sound into the bladder.

A series of highly polished sounds of this kind (Fig. 3),

from Nos. 6 to 18, should be at hand. They should be made slightly tapering at the point, so that the diameter there is two sizes smaller than higher up at the bend. Solid heavy sounds of this kind are easily passed, and are handy for ascertaining the capacity of the urethra, and for facilitating the passage of other instruments. It will frequently be found that, when neither a catheter nor a lithotrite will pass into the bladder, a heavy sound of this shape will do so; and on its withdrawal the lithotrite or cannula may be slipped in.

The *meatus* is, as a rule, the narrowest part of the urethra, and it will occasionally be found necessary, in order to pass the large instruments employed in litholapaxy, to enlarge it slightly. Should, therefore, a large sound not pass, this must be done at once. For this purpose a director is introduced into the urethra, and the floor of the *meatus* incised by means of a long slender scalpel. Or a urethrotome may be employed for this purpose. The operation is a very harmless one, and frequently procures an improvement on nature.

The question now arises as to the quantity of water the bladder should contain during the crushing of the stone. As a rule, a very small quantity, from 1 to 3 or 4 ounces, will be sufficient to protect the walls of the bladder, and at the same time permit of the necessary movements of the lithotrite. A large quantity of water is objectionable, involving an increased area over which the fragments, impelled by the currents set up by the movements of the lithotrite, may roam, and thus increasing the difficulty in catching them. If, on the other hand, the bladder be completely empty, injury to its walls may result from the lithotrite. For my own part, I am indifferent as to the quantity of water the bladder may contain, provided it be not too large.

The lithotrite is now introduced thus: The operator stands obliquely, with his left side towards the patient's face. The

lithotrite, previously screwed home, locked and lubricated, is held horizontally in the right hand by the cylindrical handle, with the beak pointing downwards. The penis is grasped between the thumb and two first fingers of the left hand, and the beak of the instrument introduced into the urethra, the penis being drawn slowly but steadily on to the lithotrite, which is gradually elevated till it reaches the perpendicular position, as it slides along the canal, which it does by its own weight. The beak will now have entered the membranous portion of the urethra as it passes through the triangular ligament. By gently pressing the handle of the lithotrite in the middle line towards the horizontal position, the beak will be found to slip along the membranous and prostatic portions of the urethra and into the bladder.

The lithotrite being thus introduced, the next stage of the proceedings consists in catching the stone. For this purpose the lithotrite is passed gently onwards, or, rather, allowed to proceed by its own weight, along the trigone, till it reaches the most dependent part of the base of the bladder, on which it is allowed to rest. The instrument is then unlocked, and the blades opened by withdrawing the male blade an inch or more, according to the size of the stone, the female blade being held steadily in position by the left hand on the cylindrical handle. The blades are now closed, when, frequently, the stone will be found between them. The lithotrite is locked, and lifted slightly off the base of the bladder, and the stone crushed by screwing the male blade home. The instrument is again unlocked, the blades opened and closed, when a fragment will be caught, and crushed as before. This process is to be repeated several times, till a considerable quantity of fine débris is made. Sir Henry Thompson compares the finding of fragments to fishing for perch—where one is found there will many be caught. We must not go searching about the bladder for fragments till those in the locality in which

the stone is first found are disposed of. The depression in the base of the bladder, caused by the weight of the lithotrite resting on it, facilitates the stone, and subsequently its fragments, falling on to the female blade. Colonel J. Richardson, I.M.S., before whom I had the pleasure of operating for the first time many years ago, writing a few days subsequently of the features in the operation that astonished him, says: 'The next was the apparent ease with which the stone first, and afterwards its fragments, tumbled into the jaws of the instrument. It almost seemed as though they were anxious to get crushed.'

Should the stone not be found by the manœuvre above indicated, it must be searched for. This is done by opening the blades of the lithotrite, turning them at an angle of 45° towards the right, and again towards the left, and closing them in these positions respectively. Should the stone still evade detection, the handle of the lithotrite must be depressed towards the horizontal position between the thighs, pushed an inch or so towards the posterior surface, and the same manœuvres gone through in that position, searching centrally, right, and left. The stone will probably be found in one of these positions; but sometimes it lies immediately behind the prostate, especially when that gland is enlarged. To grasp the stone in this position the handle of the lithotrite should be depressed between the thighs, and turned right round on its axis, so that the beak points downwards towards the trigone, but should not touch it. The blades are then opened and closed as before in this position, and if the stone lies there it will be secured. In fact, the surgeon should make a mental survey of the whole bladder, and institute a methodical search of every part of it till the calculus is found. All the movements must be light and graceful, and care taken that the mucous membrane is neither caught between the blades nor otherwise injured. In whatever position found, the stone

must be brought to the centre of the bladder and there disposed of.

Let us now assume that the stone, or a portion of it if a large one, has been reduced to fine *débris*. Should the stone be a small one—say, from a few grains up to 3 or 4 drachms in weight—its complete pulverization will probably be accomplished before the lithotrite is withdrawn, in a period varying from one to eight or ten minutes. But should the stone be a large one, a considerable amount of crushing, lasting over ten minutes or so, must be effected before removing the instrument. Before withdrawing the lithotrite, it must be locked and the blades screwed tightly home, so as to render them free of *débris*. I may here say that no instrument should be withdrawn from the bladder till quite free of fragments.

The evacuating catheter, armed with a stylet, should now be passed into the bladder, the largest size that the capacity of the urethra will easily admit being used. As soon as the stylet is withdrawn, a rush of water and *débris* will take place, to receive which a small tray or porringer should be at hand. The experience already gained in passing the solid sounds and lithotrites will afford a rough estimate of the size of cannula that the urethra will admit.

The cannula having been introduced into the bladder, the aspirator, previously filled with warm water or boric solution, is applied, the tap turned on, and aspiration of the *débris* begun. The right hand grasps the bulb of the aspirator, by the compression and expansion of which water is injected into, and withdrawn from, the bladder. With the outward stream the fragments are carried, and are seen to fall down into the glass receiver, where they remain. Should the stone be a small one, and have been completely crushed at the first introduction of the lithotrite, it will be found that, after the aspiration has gone on for a time, the whole of the *débris* will

have passed into the receiver. But if the stone be a large one, after a considerable quantity of *débris* has entered the receiver, which will vary with the amount of crushing at the first introduction of the lithotrite, little or no *débris* returns with the outward stream, but a rattling sound takes place, due to the fragments too large to pass out being carried with force against the eye of the cannula.

The aspirator is then removed, the cannula, rearmed with the stylet, is withdrawn, and the lithotrite again introduced for the purpose of crushing more fragments. This is followed by the cannula and aspirator as before. This process may have to be repeated several times, according to the size of the stone, before the whole of the *débris* is removed.

Such, then, is a general description of the operation. There are, however, difficulties met with and points to be attended to, to which I wish to draw attention here.

In the healthy urethra of an adult there are only two situations, as a rule, where difficulty may be encountered in the passage of instruments—viz., at the triangular ligament, and at the neck of the bladder. The instrument (lithotrite or cannula) should first be passed as far as it will go in the direction of the anus, thus depressing the floor of the urethra in front of the triangular ligament. ‘Traction on the penis next effaces this depression, and adds firmness to the urethral walls; so that, if the instrument be withdrawn a little, and at the same time guided by the bony arch above, it can be coaxed without difficulty through the ligament in question—a natural obstruction which physicians often mistake for a stricture. The obstruction passed, the rest of the canal is short, and corresponds with the axis of the body’ (Bigelow).

The obstruction sometimes met with at the neck of the bladder is due to the firm lower edge of the inner meatus. This may be overcome by pushing the lithotrite or cannula gently onwards in the direction of the axis of

the body, imparting to it a slightly rotatory motion if necessary.

When the urethra is capacious, and large evacuating catheters can be passed, as in the great majority of cases in the adult, it is unnecessary to reduce the stone to fine sand, as coarse *débris* can pass through these tubes into the aspirator, and it is a waste of time to reduce the *débris* to a finer consistence than what will pass through the cannula with facility.

During the earlier part of the process of aspiration, the end of the cannula should be kept towards the centre of the bladder, raised from the base, and may be moved about slightly in various directions to facilitate the flow of the fragments towards the eye; but towards the completion of the process the cannula should be allowed to rest on the base, so as to gather up the sand and last fragments.

Towards the completion of the operation it will be found that, as a rule, the last particles of *débris* lie close to the neck of the bladder, just behind the prostate. This is due to the fact that the eye of the cannula being turned towards the posterior aspect and sides of the bladder, the water is less disturbed by currents in the position referred to than in any other. Consequently, the last particles of *débris* gravitate towards this spot. Towards the end of the operation, therefore, the eye of the cannula should always be turned right round towards the prostate, and water forcibly injected, so as to dislodge the *débris* from this position. This manœuvre is especially necessary where enlargement of the prostate co-exists, otherwise a fragment might be left behind.

On compressing the bulb and pumping water into the bladder, the *débris* is scattered away from the eye of the cannula. Before allowing the stream to return by the expansion of the bulb, the hand should rest a second or two, so as to allow the *débris* to settle down again in the vicinity of

the eye. The evacuation of the débris will sometimes be found to take place best by injecting 3 or 4 ounces of water into the bladder with each compression of the bulb; at others a much smaller quantity will be found most effectual. No definite rule can be laid down for all cases.

Sir Henry Thompson lays stress on the necessity of having the movements of the aspirator synchronous with those of the chest during respiration; the water being pumped into the bladder during expiration, and exhausted therefrom during inspiration. During my earlier operations I had recourse to this manœuvre a good deal, but I came long ago to regard it as an unnecessary and, indeed, frequently impracticable refinement. Patients vary so much in the rapidity of their breathing under the influence of an anæsthetic that the suggestion frequently cannot be attended to, even if desired.

It sometimes happens, even when the patient is fully anæsthetized, that spasm of the bladder occurs. During its existence all manipulation should be suspended, otherwise the bladder might be injured. Should the lithotrite be in the bladder, it must be closed and kept unmoved till the spasm passes over. If the cannula be in the bladder, the water should be allowed to escape.

During the process of aspiration, with each expansion of the indiarubber bulb the fragments of calculi are carried against the eye of the cannula by the outward rush of water, and a clicking sound is thus produced, which, whilst it continues, indicates that some fragments remain in the bladder. There is, however, a peculiar sound sometimes produced, the occurrence of which the young litholapaxist should be acquainted with, as it is very likely to be confounded with the sound produced by a fragment. This 'false sound,' as it may be called, is produced by the mucous membrane of the bladder being sucked into the eye of the cannula during exhaustion of the water. It is most likely to occur towards the end of the opera-

tion, when all, or nearly all, the fragments have been exhausted, and especially when the bladder contains no surplus water, only that quantity which is pumped in and withdrawn during compression and expansion respectively of the bulb. It may, however, be produced at any time if, after compressing the bulb, the eye of the cannula be turned towards the sides, or directed up against the apex of the bladder, and the bulb of the aspirator be then allowed to expand. The sound itself, though difficult to describe, can never be mistaken when once recognized. The sensation communicated to the hand is of a fluttering, jerky character, accompanied by a dull, muffled sound, as contrasted with the clear, ringing click which the impact of fragments imparts to the instrument. On its occurrence the outward stream receives a sudden and complete check: whereas, when a fragment obstructs the stream, a portion of the water continues to flow. The sound does not recur if the cannula be partially withdrawn and raised towards the perpendicular position, so as to bring the eye close to the neck of the bladder, with the end of the cannula resting on the trigone; whereas a fragment will produce obstruction there as well as in any other position. On first practising litholapaxy, I was deceived by this sound, and since then I have seen many inexperienced litholapaxists similarly deceived.

It frequently happens that, during the process of aspiration, a fragment which is too large to pass through the cannula gets caught in its eye. This is recognized by the fact that the outward stream is arrested, and the bulb of the aspirator ceases to expand. The fragment should at once be displaced. This, as a rule, may be effected by compressing the bulb suddenly and with force, when the fragment will be expelled by the inward stream. Should this manœuvre fail after being tried two or three times, a stylet should be introduced through the cannula, and the fragment displaced in this way. But

the cannula should on no account be withdrawn with the fragment sticking in its eye, as in this way the urethra may be injured, or the fragment get caught in the mucous membrane, displaced from the eye of the cannula, and thus impacted in the urethra.

Should a fragment get impacted in the urethra, how are we

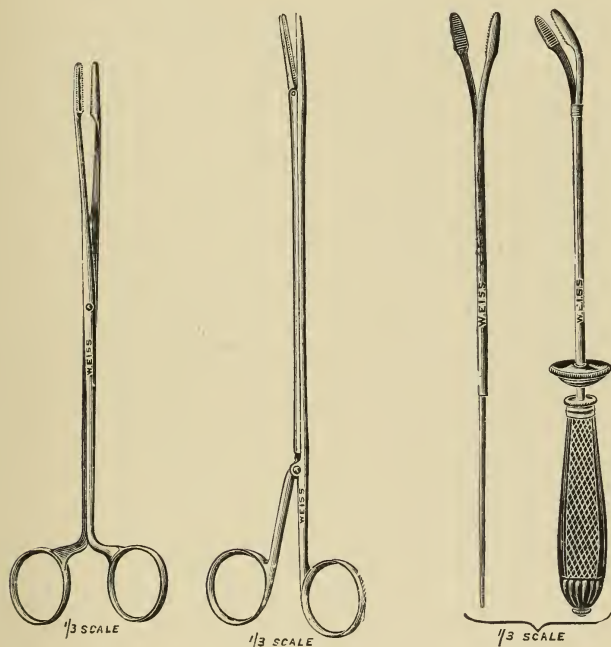


FIG. 126.

to deal with it? If the precautions indicated in the last paragraph are taken, there will be little fear of its occurrence. Still, it is an accident that has to be reckoned on. If the fragment be lodged in the prostatic portion of the urethra, it may easily be displaced backwards into the bladder by passing a large cannula as far as the obstruction, applying the aspirator, and injecting water with some force, when, as a

rule, the fragment will rush back into the bladder, to be there disposed of. If the fragment be arrested in the anterior 3 or 4 inches of the canal, it can be removed with one or other of the various kinds of urethral forceps in use (Fig. 126). When deeply placed in the membranous portion of the canal, it may still be removed in this manner; but, if tightly impacted, it may be necessary to remove it by external urethrotomy, an occurrence which, however, I have never seen.

Where there is great irregularity of the inner surface of the bladder, it may be extremely difficult to get rid of the last fragment. I have experienced this frequently. The aspirator is applied, and time after time the fragment clicks against the eye of the cannula, but, on introduction of the lithotrite, the fragment cannot be grasped. Great perseverance may be necessary, especially if the fragment be a broad, thin shell from the outer crust of a large stone. A manœuvre that I have found useful is to employ the suction force of the cannula and aspirator to bring the fragment out of the depression in which it lies, close to the neck of the bladder, and then to introduce the lithotrite and catch the fragment in this position. If the fragment lies in a depression behind the prostate, the forefinger may be introduced into the rectum. The lithotrite being in the bladder, the fragment of stone may now be pushed out of the depression in which it lies by the point of the finger, and caught by the lithotrite with a little manipulation. This manœuvre, which I have frequently found successful, was suggested to me by my friend Major J. Blood, I.M.S., now of Birkenhead.

The larger the evacuating cannula, the less necessity there will be for crushing the calculus into fine powder, and, consequently, the less time will the operation require for its performance—a matter of no small importance when we have to deal with a large stone in a patient whose constitution has

been very much worn by the disease. It is, therefore, advisable to employ the largest cannula that will pass with ease into the bladder. I cannot too strongly deprecate the use of any force in passing a catheter, or, indeed, any instrument, into the bladder; but the baneful effects which Sir Henry Thompson anticipated from the use of large instruments, experience has shown to be imaginary. Sir Henry says that the instruments should be proportionate to the size of the stone, but experience has taught me that the capacity of the urethral canal is of much more importance in determining the size of the instruments, and that the largest lithotrite and cannula that can be passed without the use of any force should be employed. A large lithotrite is much handier in the bladder, less liable to get clogged by *débris*, and much more efficient, not only for crushing large calculi, but for disposing of fragments of *débris*, than a small one; and I fully agree with Bigelow that when one gets accustomed to the use of a large lithotrite he does not willingly abandon it for a smaller instrument.

It will be absolutely necessary to have recourse to large instruments much more frequently in India than in this country, for the simple reason that the great majority of calculi are large when coming under observation in the former country.

As a rule, there ought to be little or no loss of blood attending the operation, with the exception of the trifling bleeding that follows the incision in the floor of the urethra, when this is necessary to enlarge the *meatus*. I have frequently removed very large calculi with scarcely a tinge of blood in the washings from beginning to end. In some cases, however, the mucous membrane of the urethra is highly sensitive to the passage of instruments, and considerable bleeding takes place. In such cases I am in the habit of using a weak astringent in the washings—say, $\frac{1}{4}$ grain of

acetate of lead to the ounce—and winding up the proceedings with a stronger solution.

The operation being completed, the patient should be put to bed, and well wrapped up in warm clothing. A morphia suppository should be at once introduced. In India I was in the habit of administering a large dose of quinine as soon as the patient recovered consciousness, and repeating the drug in smaller doses for a few days. I follow the same practice in England after all operations involving the passage of instruments through the urethra on patients who have lived in malarial climates. Such persons are particularly prone to fever after operations on the urinary organs, and there is no doubt that the judicious administration of quinine, combined with an opiate, has frequently the effect of warding off such attacks. The food for the first few days should be of a light kind, consisting mainly of milk and soups. A demulcent and alkaline drink should be allowed. My favourite mixture is a quart of barley-water, mixed with which are one drachm each of liquor potassæ and tinct. hyoscyami, and this the patient is encouraged to drink freely.

For the first twenty or thirty hours the urine may be tinged with blood, particularly till the operator has had large experience in this branch of surgery, and there will, as a rule, be considerable burning sensation along the course of the urethra, with some difficulty of micturition. The treatment indicated in the last paragraph will tend to alleviate these symptoms. Should there be any pain or tenderness on pressure in the region of the bladder, hot fomentations, assiduously applied to the hypogastric region, will also be found soothing; and pain in the perineal region will be lessened by fomenting these parts.

Retention of urine is a rare sequel of the operation, for which a hot hip-bath will be found most effectual. Should this fail, recourse must be had to the catheter. More rare

still is total suppression of urine, which should be dealt with on general medical principles. This occurs only in patients whose kidneys are diseased, and is of very grave import.

When the patient is the subject of enlargement of the prostate, it may be advisable to pass and tie in a soft catheter for a few days, to allow the water to flow in this way.

Acute inflammation of the testicle is a sequel of the operation that has from time to time occurred in my practice, and readily yielded to the ordinary treatment for that complication.

The most frequent sequel of the operation in India is the occurrence of fever. To the ordinary catheter or urethral fever, long recognized as attending the passage of instruments through the urethra, we have superadded, as it were, the effects of malaria; and the supervention of this fever is a contingency that will have to be reckoned with in a large proportion of the cases dealt with. The attack sets in, as a rule, a few hours after the operation, frequently after the first act of micturition, and passes through the usual stages—*cold*, *hot*, and *sweating*—of an ordinary attack of intermittent fever, from which it is scarcely to be distinguished. The treatment will also be the same as in ague—extra warm clothing, hot-water bottles to the extremities, and the administration of hot drinks, particularly tea, during the cold stage. As this passes into the hot stage, part of the clothing must be removed, and the patient's thirst relieved by copious drinks of water, lemonade, etc. The ordinary diaphoretic mixture should also be given to encourage perspiration. When the sweating stage sets in, warm clothing must be again supplied to encourage perspiration, and prevent the patient catching cold. During the intermission quinine should be given. The fever is, as a rule, very amenable to treatment.

The beginner will do well to commence by operating on cases where the stone is small and the urethra capacious. As

experience is acquired large calculi and those attended by complications are to be attacked.

Previous to undertaking the operation for the first time, it will be well, when possible, for the surgeon to pay a visit to one of those hospitals where the operation is performed. More information will be gained by seeing the operation once well performed than from any amount of reading and theoretical knowledge.

The length of time occupied by the operation ranged from a couple of minutes to two and a half hours. It will vary, of course, with the size and consistence of the stone, the capacity of the urethra, the facility with which the instruments can be introduced, and the experience and dexterity of the operator. I am now in the habit of crushing as much of the stone as possible before withdrawing the lithotrite, so that in most cases of stone of ordinary size only one introduction of this instrument is necessary. The repeated introductions of instruments should, I think, be avoided as much as possible. Rapidity of execution is a quality which comes with practice; and there is no doubt that, all undue haste and roughness of manipulation being avoided, it is desirable to complete the operation as rapidly as possible, particularly when the patient is old and much enfeebled by the disease.

The patients were, as a rule, anæsthetized during the operation. During the last few years I have, however, been performing the operation without an anæsthetic in an increasingly large number of suitable cases. With a capacious urethra in an adult, I should not hesitate to attack a stone of about an ounce in weight without the aid of an anæsthetic, or with local anæsthesia by cocaine only, in a case in which the internal administration of an anæsthetic was undesirable, or strongly objected to by a patient.

LECTURE XVII

LITHOLAPAXY : COMPLICATIONS AND DIFFICULTIES ENCOUNTERED IN CONNEXION THEREWITH

Large Calculi.—With a capacious urethra in an adult male, there being no enlargement of the prostate, and the bladder being roomy and non-sacculated, the experienced litholapaxist should have no difficulty in disposing of a stone of moderate dimensions—say, under 2 ounces in weight. When, however, the stone, if at all a hard one, exceeds this weight, the operation becomes a much more serious and difficult one. I find that amongst my series of 986 litholapaxy cases there were 37 weighing 2 ounces and upward; 9, 3 ounces or over; and 1, $6\frac{1}{8}$ ounces.

The removal of large calculi of these sizes demands much patience, perseverance, skilful manipulation, and manual labour. It is, indeed, no light or easy task, and will be found to call forth all the resources of the surgeon. Before attacking a stone of 2 ounces and upwards by the modern operation, a surgeon should have had considerable experience in dealing with smaller calculi. The chief difficulties met with and the means by which they may be overcome are well illustrated in the following cases, as also in Case 379, recorded in connexion with the complication of enlarged prostate :

Litholapaxy, Case 16.—I. B., aged sixty, admitted into the Moradabad Civil Hospital, December 3, 1882, with all the symptoms of stone in the bladder, which had existed eleven years. The patient could only pass

urine in drops continuously throughout the day and night, and its passage was attended with great pain. His penis and foreskin were hypertrophied from the patient's constantly rubbing the organ to relieve the pain and irritation. The urine was mixed with pus and blood. The fæces were ribbon-shaped, due to pressure of the stone on the rectum. On passing the finger into the rectum, a large stone could be felt in the bladder. The patient was pale, thin, weak, and anæmic, and he had a pinched, anxious expression, the result of long suffering. On December 6 I performed litholapaxy. The operation lasted sixty-six minutes, and the débris weighed $3\frac{1}{2}$ ounces, the calculus being a hard uric-acid one. Considerable trouble was at first experienced in grasping the stone, owing to the contraction of the walls of the bladder on it. This was obviated by injecting water into the bladder. The lithotrite was introduced at least a dozen times, and after each crushing a large quantity of débris was washed out through a No. 18 cannula.

With the exception of slight pain in micturition during the first day or two, the patient had no after-trouble. He made a rapid recovery, and on December 15, when discharged from the hospital, the following entry in my note-book describes his condition: 'Patient now rid of all bladder symptoms. Urine quite clear; bladder retains a large quantity at a time. Has grown fat and strong. Says he has not been so well for several years. This man was a miserable creature on admission to hospital ten days ago, and now leaves it in excellent health.'

Litholapaxy, Case 517.—A male, aged forty-five, with symptoms of stone lasting twelve years. He was in wretched health, the urine being muco-purulent and fetid. The operation was performed on February 20, 1892, Lieutenant-Colonel Tuohy, now of Hove, being present. When placing the patient on the operating-table, I imagined that supra-pubic lithotomy would be necessary, but determined to try litholapaxy. Introducing my largest lithotrite, after some manipulation I caught a portion of the stone (which I found was irregular in shape), broke it off, and reduced it to fine fragments. This process I repeated again and again, chipping off portions, or scraping the sides of the stone, till I had removed about 3 ounces of débris. I then found that the main body of the stone was lying in a wide-mouthed pouch at the posterior part of the bladder. After some difficulty I grasped the stone in this position, but could not move it from the sac into the main cavity of the bladder. After much effort I crushed the stone *in situ*, and then pulverized the fragments one by one, some in the pouch, and some in the general cavity of the bladder. The central portion of the stone, $1\frac{1}{2}$ inches in diameter, was so extremely hard that several of my most powerful efforts with the lithotrite were necessary before it was crushed. The operation lasted two hours, during which $3\frac{1}{2}$ ounces of chloroform were used. The débris of stone weighed

6 $\frac{1}{8}$ ounces. The patient was much exhausted after the operation, but soon picked up strength. Colonel C. Seymour saw him with me on February 24, when he was sitting up in bed; and on March 9 he was free from urinary symptoms, but weak. On June 18 Colonel Seymour, who took charge of my work during my holiday, wrote me: 'That man from whom you removed that enormous stone came to show himself the other day. The last time I saw him he came in a dooly, looking like an old man of seventy. Now he looks a fairly robust man of forty. I would not have believed such a change possible. He is able to walk as well as ever.' One year after the operation, February 21, 1893, this man appeared before me in hospital in perfect health. He informed me that his wife had presented him with a daughter one month previously, though he had lost all sexual power for several years before the operation.

By the process of chipping and scraping above indicated, and fully described later on, large calculi can be reduced to such a size that they can be caught and crushed by a lithotrite which would not originally lock on them. In this way I have crushed successfully in a lad of fifteen years a stone weighing more than 3 $\frac{1}{4}$ ounces by a No. 9 lithotrite. The amount of manual labour required for dealing with these large calculi is excessive. My hands are often blistered and my arms frequently ache for days after performing litholapaxy in one of these cases. Great patience will be required in the various manipulations before the stone is caught. As a rule, when the stone is large the walls of the bladder hug it closely, so that the manœuvre referred to in these cases, of injecting water to separate the walls of the bladder from the stone, must be had recourse to before the stone can be grasped by the lithotrite. It will sometimes be found, also, in dealing with large calculi, that though the lithotrite will not lock should the stone be first grasped by the long axis, it will do so if this is changed for the short axis of the stone. This manœuvre should always be tried before abandoning the case as unsuitable for litholapaxy. And here I may mention that experience has taught me that, as a rule, a stone lies in the bladder with its long axis in the antero-posterior direction.

Encysted Calculi.—The manner in which the main portion of the calculus referred to in Case 517, which lay in a pouch, was disposed of, naturally leads one on to the consideration of encysted calculus of the bladder. In a paper* which I read at the International Medical Congress at Rome in 1894, I called the attention of the profession to this subject. Previously such cases had, by general consensus of opinion, been relegated to suprapubic lithotomy; and I am unaware of any published writings in which dealing with them by litholapaxy had been advocated. When the opening into the sac in which the stone lies is narrow, or when the stone almost fills the pouch, it will be necessary to have recourse to cystotomy; but, so far as my experience goes, such cases are rare, the stone as a rule lying loosely in a wide-mouthed pouch. For several years I have now been in the habit of dealing with encysted calculi mostly by litholapaxy, withdrawing the stone into the general cavity of the bladder when possible and crushing it there; otherwise crushing it in the sac. Though limits of space will not permit of my dealing exhaustively with this subject here, I will venture to give one typical example:

Litholapaxy, Case 513.—January 30, 1892, a male, aged sixty, admitted to hospital with symptoms of stone of three years' duration. These had commenced with severe kidney colic. The patient was so weak and in such pain that he could not leave his bed. Passing blood and pus in the urine. Dysentery and piles also present. On January 31 I performed litholapaxy. The stone was felt to be a large one, lying in a sac on the right side of the bladder. It was found impossible at first to grasp the stone, owing to the walls of the sac hugging it rather tightly. By injecting water into the bladder by the aspirator this difficulty was overcome, the stone being caught by the lithotrite in the sac. I tried to withdraw it into the bladder, but this could not be effected owing to the neck of the pouch being too narrow; so the stone was crushed *in situ*. After this the fragments were crushed, some in the sac and some in the general cavity of the bladder. No. 15 lithotrite and No. 18 cannula were intro-

* *British Medical Journal*, June 16, 1894.

duced several times before the whole of the débris, which weighed 705 grains, was removed. The stone was mainly phosphatic. After the calculus had been removed I made a survey of the sac by means of the lithotrite. It appeared to be egg-shaped, with smooth walls. The opening into the bladder was circular, with a sharp, smooth, well-defined edge, and $1\frac{1}{4}$ inches in diameter. The depth of the sac as felt by the lithotrite was $3\frac{1}{2}$ inches. The day after the operation the patient was sitting up in bed, free from pain and passing urine freely. He said he had not felt so well for two years. He made a rapid recovery, and was discharged on February 6.

Urethral Stricture.—Of all the complications met with in the treatment of stone by litholapaxy, the most difficult to deal with is, perhaps, the presence of organic stricture of the urethra. To permit of the large instruments employed in this operation passing through the urethral canal the stricture must first of all be disposed of. This will be accomplished by either internal urethrotomy or dilatation, according to the nature of the stricture. If the case be one suitable for dilatation—that is to say, if the stricture be soft, elastic, and dilatable—this is best done by passing rapidly in succession a series of conical steel sounds (Fig. 3), two or three sizes larger at the bend than at the point, till the canal is sufficiently dilated; and then at once introducing the lithotrite and disposing of the stone. If the structure be tight but dilatable, it will be well to commence its dilatation a couple of days before the operation by tying in gum-elastic catheters of successively larger sizes till No. 8 or 10 is reached, and then, on the day of the operation, completing the dilatation by large conical steel sounds rapidly passed in succession. If, however, the stricture be hard, cartilaginous, and non-dilatable, it must be dealt with by internal urethrotomy immediately before the operation for the stone.

The following illustrative cases will show the manner in which this complication may be successfully dealt with:

Litholapaxy, Case 51.—A male, aged sixty-five, admitted July 5, 1883, with symptoms of stone, the presence of which was confirmed by the

sound. The symptoms had existed three years, and the patient was extremely weak, being unable to stand or even sit up without aid. There was excruciating pain in passing water. He had to pass urine every half hour or so. The urine was blood-stained, and mixed with pus and shreds of lymph. On passing the sound it was ascertained that there were two strictures present, one an inch behind the glans and the other 4 inches from the meatus, through which a No. 6 sound only would pass. The patient was suffering from fever, and so extremely weak that I was afraid to undertake any operation; admitted to hospital and placed under preliminary treatment. On July 8 there was very little improvement, and I determined to operate. The patient being anesthetized, the strictures were cut by means of the urethrotome. A full-sized lithotrite was then passed, the stone caught and crushed, and the debris removed through a No. 18 cannula, which was passed without difficulty. The stone, which was uric acid, weighed $1\frac{1}{2}$ drachms. The bladder felt sacculated, and a large quantity of filthy pus and flakes of lymph was brought away by the aspirator with the fragments of stone. The operation lasted only ten minutes. A full-sized gum-elastic catheter was then tied in. July 9: Patient very weak; suffered from high fever last evening; urine blood-stained and mixed with pus. July 10: Fever again last night; very weak, and wanders in his conversation. July 11: No fever; patient much better, sitting up in bed; urine clear; catheter removed. From this time convalescence was rapid, and he was walking about on July 14. Discharged cured on July 20.

Litholapaxy. Case 598.—This patient was operated on by me on March 9, 1894, in presence of the students in one of the large London hospitals, by kind invitation of one of the surgeons on the staff. A male, aged forty-five, suffering from stone and double stricture of the urethra, the latter having existed several years. Both strictures being dilatable, conical steel sounds were passed rapidly in succession up to No. 12 English. The only larger sound available was a No. 15, which would not pass. No. 10 lithotrite was introduced, but after several unsuccessful attempts to crush the stone it was withdrawn. After some manipulation I managed to push the No. 15 sound through the strictures. A No. 14 lithotrite was then passed, the stone crushed, and the debris removed through a No. 14 cannula. The patient made a rapid and uninterrupted recovery. This patient appeared at the same hospital eighteen months after, when he was found to be free from stone and stricture.

Hypertrophied Prostate.—Enlargement of the prostate is a complication which, contrary to what might be expected, as a rule offers little obstruction to the performance of litho-

lapaxy. In passing the instruments over the enlarged prostate a little extra manipulation may be necessary, and this can only be learnt with practice. When obstruction is met with at the prostatic portion of the urethra, I find the manipulation of depressing the handle of the lithotrite between the thighs, and pushing it on with a slightly rotatory or boring motion in the direction of the axis of the body, frequently successful in entering the bladder. Should this fail, it will be necessary for the surgeon to change from the right side of the patient to the left, and, by means of the forefinger of the left hand in the rectum, holding the lithotrite in the right, endeavour to guide the point of the instrument over the obstruction into the bladder.

When considerable hypertrophy of the prostate exists, and particularly when there is a median outgrowth, owing to its projection into the bladder, there is naturally a pouch formed between the posterior surface of this organ and the base and posterior wall of the bladder. It is in this pouch that, as a rule, the stone lies; and, in order to catch it there, it will frequently be necessary to turn the jaws of the lithotrite round so as to point downwards, and then to open them in this position, when, by a little manipulation, the stone, and subsequently its fragments, will be caught.

When the patient is dependent on the catheter, care must be taken to draw the urine off three or four times daily after the operation, or a soft rubber catheter may be tied in and the urine allowed to flow by this for a few days.

There is generally a good deal of bleeding during the performance of litholapaxy when the prostate is enlarged. It is necessary in such cases to exercise great care in removing the last fragments, for they frequently get embedded in clots of blood in the bladder, which have to be broken up by frequent washings by the aspirator, and then removed with the entangled débris of stone.

The following cases illustrate some of the difficulties met with, as also the after-treatment :

Litholapaxy, Case 34.—A mason, aged eighty-five, admitted April 15, 1883, with symptoms of stone, which had existed two years. There was great pain in passing urine, which came away in small quantities at a time, frequently repeated. On passing a sound, the presence of a stone was confirmed, and the existence of a greatly enlarged prostate also ascertained. On passing a catheter, a large quantity of residual urine was drawn off. The patient was emaciated, extremely feeble, and almost in a dying state. Still, he was at once anæsthetized, and litholapaxy performed. There was considerable difficulty at first experienced in passing the lithotrite over the prostate. This was obviated by passing the instrument on the left side, with the finger in the rectum as a guide. The operation lasted twenty minutes, during which $6\frac{3}{4}$ drachms of a very hard uric-acid calculus were removed. The lithotrite had to be introduced four times, and a No. 16 cannula as often. Evening: Retention of urine; catheter passed and water drawn off; patient suffering from high fever, very weak. 16th: Fever less; retention of urine continues; catheter passed every six hours. From this time the patient made a rapid recovery, putting on flesh and picking up strength, and was discharged cured of stone on April 26, but practically dependent on his catheter.

Litholapaxy, Case 379.—R. B., aged seventy-five, admitted to hospital, April 14, 1890, with large stone of six years' growth. Extremely weak and in great pain; passing urine every fifteen minutes, frequently mixed with blood. Prostate much enlarged. Litholapaxy performed April 15. I introduced my largest lithotrite, No. 18, and at once caught the stone, but found I could make no impression on it. Eventually one end of the stone, which was oval, was caught, and with a great effort broken off. This was then reduced to débris, and removed by the aspirator. This process was repeated again and again till the whole stone was disposed of. There was considerable bleeding during the operation from the enlarged prostate, but the patient bore the operation, which lasted an hour and a quarter, well. The débris was that of an oxalate of lime stone, and weighed $3\frac{1}{2}$ ounces. Evening: Patient wonderfully well; passing urine freely, slightly coloured with blood. No fever; slight pain in the perineum, relieved by hot fomentations. Next day the urine was clear. April 20: Walking about, free from all urinary symptoms. Discharged April 27, in excellent health. The prostate had greatly diminished in size, thus illustrating what I have frequently verified in practice—namely, that the presence of a stone in the bladder will often cause congestive or inflammatory turgescence of an already enlarged prostate, which quickly subsides if the stone, the source of irritation, be completely removed.

We must not expect, however, to be successful in performing litholapaxy in every case in which hypertrophy of the prostate occurs in connexion with stone in the bladder. It will occasionally be found that, even when a large steel sound can be passed readily into the bladder in such cases, no amount of manipulation will enable us to pass a lithotrite, with its sharply curved beak. The use of force of any kind in passing instruments in such cases must be carefully avoided; and if the lithotrite cannot be coaxed in by that amount of manipulative skill which the surgeon from his experience has acquired, the idea of performing litholapaxy must be abandoned, and suprapubic or perineal lithotomy had recourse to, according to the circumstances of the case.

With the brilliant success now attending the operation of enucleation of the enlarged prostate, it is rare indeed that the surgeon will stop short at litholapaxy in such cases, the operation of choice being the removal of the stone suprapubically, followed at once by enucleation of the prostate. Still, cases will occasionally occur in which conditions of general health may contraindicate the more radical operation, but in which removal of the stone by litholapaxy may be advisable, to ameliorate the painful symptoms due to this cause.

Partially Impacted Calculus.—A difficulty is sometimes met with, both in passing the instruments and catching the stone, when the calculus lies stationary, growing partly in the bladder and partly in the prostatic portion of the urethra. From one's experience of lithotomy, the difficulty of managing such cases may be easily imagined. Every lithotomist of any experience must have come across cases in which an irregular, elongated calculus lies with its main portion, or body, in the bladder, and a small elongated head in the prostatic urethra, the two portions being united by a neck corresponding with the vesical orifice of the urethra (Fig. 106). Such a calculus

must, if possible, be displaced from its position backwards into the bladder before being crushed, otherwise lithotomy will have to be performed. The manner of dealing with such calculi will be best illustrated by a case from actual practice:

Litholapaxy, Case 121.—This case I saw in consultation with the late Surgeon-Major Fasken, at Dehra Doon. A male, aged thirty-two, with stone, which had existed five years. Patient very thin and weak; passed urine in drops with great pain. On the 20th, chloroform being given, I operated. On passing a full-sized sound, the stone was met with at the neck of the bladder, and obstructed its advance, but by manipulation the sound was passed into the bladder *over* the stone. The same difficulty was experienced in passing the lithotrite, and the stone could not be grasped. The lithotrite was therefore withdrawn, a No. 18 cannula introduced as far as the end of the stone lying in the prostatic urethra, the aspirator applied, and water pumped with force into the bladder. By this manœuvre the stone was displaced backwards into the bladder by the force of the stream, the prostatic urethra which grasped the stone being at the same time dilated by the water, and so loosening its hold on the stone. The stone was then grasped by the lithotrite, and soon disposed of, the débris of the stone, which was mixed uric acid and phosphates, weighing $5\frac{1}{2}$ drachms. There was some pain in the urethra for a day or two, with some dribbling of water, but the patient was discharged on April 3 perfectly well.

Male Children.—It was not till 1886, four years after I had commenced to perform litholapaxy in adult males, that I extended the operation to male children. Though an ardent advocate of the operation in the adult male and females of all ages, I, like most other surgeons, at first opposed its extension to the case of male children, basing my opposition on the undeveloped condition of the genito-urinary organs—the bladder being small, the urethra narrow, and the mucous membrane sensitive and liable to laceration. On the other hand, perineal lithotomy in the child had always been a comparatively successful operation; and, so far as my own experience of it was concerned, I had no reason in this respect to abandon this operation in favour of litholapaxy, having, before adopting litholapaxy in such cases, performed 145 lithotomies in male

children without a death. I may mention that I have now performed 197 lithotomies in male children with only one death. In fact, I had the good fortune of having performed 191 successful consecutive lithotomies in children before a fatal case occurred. In spite of this success, however, I was so much impressed by the results of litholapaxy in male children announced by Keegan in two very able and interesting papers published in the *Indian Medical Gazette* in 1885, that I at once ordered the necessary instruments, and decided on giving the operation a trial. Since that time I have performed litholapaxy in male children 184 times, with two deaths. My first 119 cases were all successful, and I had then the misfortune of losing two cases consecutively. Full details of my first 115 cases were given in three papers in the *British Medical Journal*.^{*} All our foregone theoretical objections to this operation in case of male children have vanished into thin air when pitted against the stern reality of accomplished facts. Notwithstanding the great success I have had with lithotomy, I have abandoned the operation in favour of litholapaxy, owing to the two great advantages that the latter possesses—rapidity of cure, and avoidance of a cutting operation. The greater my experience of litholapaxy in male children becomes, the more I am fascinated by the operation. In most instances the little patients may be seen playing about the day after the operation, untroubled by any urinary symptom. To Keegan is due the honour of having, in the face of strong opposition and prejudice, shown that litholapaxy in male children is both feasible and safe; and I feel proud that this honour has fallen to a brother officer of the Indian Medical Service, a Service which has done so much to popularize and extend Bigelow's operation.

For the performance of litholapaxy in male children, it is essential that the surgeon should be provided with a series of

^{*}1. December 24, 1887; October 12, 1889; May 9, 1891.

small fully fenestrated lithotrites of the same patterns as those used for adults, but varying in size from No. $4\frac{1}{2}$ to 10. It will be found that in boys aged from thirteen to sixteen years a lithotrite of size No. 11 or 12 will pass readily as a rule. The cannulæ employed are also similar in shape to those used for the adult, but vary in size from Nos. 6 to 11, English scale. The smaller sizes should be not more than 7 inches in length, as the return stream through these small cannulæ is very weak, and diminishes in strength with the length of the tube. The aspirator is the same as for adults; but it must, of course, be worked very gently, only a small quantity of water, proportional to the size of the bladder, being thrown in. Any smaller or weaker apparatus will not suffice to extract debris through the narrow cannulæ, owing to the stream being so feeble.

It will be found that the capacity of the urethra in patients of the same age varies much more in children than in adults. Keegan was the first to call attention to this fact, which I have frequently verified in my practice. Thus, the urethra of a child of five or six years of age will frequently be found to admit a No. 10 lithotrite with ease; in other instances a No. 6 is passed with difficulty.

The meatus of the urethra in children is, as a rule, very narrow, and frequently requires to be enlarged to permit the litholapaxy instruments to pass. The incision should be on the floor of the urethra.

I find that in children, after the meatus has been enlarged, the first two inches of the urethra is, as a rule, the narrowest and most difficult part through which to pass the lithotrite; whereas in adults the difficulty, when one occurs, lies generally at the triangular ligament or prostatic portion of the canal.

In children the operation is, for the same size of stone, a much more tedious one than in the adult, owing to the small

size of the instruments employed, and the necessity to grind the calculus into very fine débris before it will pass through the cannulæ.

There is more danger of a fragment of stone being left behind in children than in adults. The stream passing through the small tubes employed has not the same evacuating force as in the large cannulæ used in adults. The débris is not, therefore, carried with the same certainty towards the eye of the cannula from the various parts of the bladder; and the fragments do not give out the diagnostic clicking sound so clearly. It is therefore necessary to institute a very careful search by pumping in water and exhausting it, with the eye of the cannula turned in various directions, before the instruments are finally withdrawn. In the hands of a careful and experienced surgeon there is little chance of a fragment being left behind.

Litholapaxy should not be attempted in a child when the smallest lithotrite at hand is a tight fit for the urethra. When the instruments fit tightly at first, there may be some difficulty in their reintroduction, or even in their withdrawal, owing to the congestion and swelling of the urethral mucous membrane that takes place near the meatus. I have noticed this phenomenon, but to a much slighter extent, in young adults, but never in old men.

When the urethra in a male child is capacious, and the calculus of moderate size, litholapaxy can be performed with facility; but when the urethra is very narrow, or the stone large, the operation is a difficult one. In any case, litholapaxy in male children is a much more delicate one than in the adult. I do not think that a surgeon would be at all justified in attempting this operation in a male child till he had had very considerable experience of it in the adult.

If it was necessary to caution the surgeon against the use of force in passing instruments in the adult, this is doubly

necessary in the case of children, in whom the mucous membrane and other tissues are so delicate and easily lacerated.

The youngest child on whom I have performed litholapaxy was one aged eighteen months, the details of which are as follows :

Litholapaxy, Case 276.—A male child, aged eighteen months, admitted to the Moradabad Hospital, November 2, 1888, with symptoms of stone of two months' standing. On passing a sound a faint click was heard. Next day I performed litholapaxy in presence of Surgeon-General W. R. Rice. A No. 5 lithotrite passed with the greatest ease, and the tiny stone was at once caught and crushed, and evacuated through a No. 6 cannula. In withdrawing the lithotrite some difficulty was experienced, owing to congestion and spasm of the urethra. The operation lasted eight minutes, and the debris (urates) weighed 3 grains. I saw the child in the evening, and he was passing urine freely and without pain. Next day he was quite well. On November 3, two days after the operation, the child was seen by Dr. Rice, who expressed much surprise at the rapid cure in a child of this age.

This is, as far as I am aware, the youngest child on whom litholapaxy has as yet been performed ; but the facility with which the instruments were introduced convinces me that the modern operation is practicable in even younger children. In this connexion I may mention that on June 7, 1889, a male child, nine months of age, was brought to me with symptoms of stone, but in whom no stone was found. In this case I passed a No. 6 cannula, and washed out the bladder by the aspirator for diagnostic purposes. Had there been a stone present, I could have removed it by litholapaxy readily. So that litholapaxy is practicable in children of the most tender ages.

The following is a very remarkable case from various aspects, so I will give it in detail :

Litholapaxy, Case 350.—A boy, aged fifteen, admitted to the Moradabad Hospital, December 24, 1890, with symptoms of stone of four years' duration. So miserably weak that he was unable to walk or even to stand up ; in constant agonizing pain, the urine passing in drops continually.

Foreskin ulcerated, the result of the patient pulling at it to relieve pain. Spleen enormously hypertrophied, measuring, roughly, 1 foot long by 10 inches broad, and literally filling the abdomen. Had suffered from fever for several months ; very anæmic, with pinched, anxious face. The lad was a living skeleton, and presented a miserable spectacle, the result of long suffering. Large stone of irregular shape felt by the sound. The suprapubic operation suggested itself, but a cutting operation of any kind was out of the question, owing to the wretched health of the lad. Placed under preparatory treatment.

On December 26 I performed litholapaxy, Lieutenant-Colonel S. F. Freyer, R.A.M.C., being present. The largest lithotrite that would pass, after incising the floor of the meatus, was a No. 9, and the largest cannula a No. 12. Stone easily caught, but too large for lithotrite to lock on it. This diameter was then changed for a shorter one, on which the lithotrite locked; but the stone was so hard that the lithotrite failed to crush it. I then grasped the stone by one end, and after some manipulation broke off a portion. This was then reduced to fine *débris* and evacuated through a No. 12 cannula. The lithotrite was again introduced, another portion of the stone chipped off, and treated in a similar manner. This process was continued, and varied from time to time by scraping the sides of the stone by the jaws of the lithotrite, till after working for one hour I imagined I had completely emptied the bladder of stone, having removed a mass of *débris* which I roughly estimated to weigh nearly 2 ounces. On careful examination I found, however, that there was a tumour, elongated in shape, in the right groin. This I found to be a second calculus, situated in a pouch, apparently in the line of the ureter. The outline of the stone could be seen through the abdomen; and it could be felt in position between a finger introduced into the rectum and a hand placed on the abdomen. On introducing the lithotrite, I could touch the lower end of the stone, which, however, could neither be grasped nor displaced from its bed. The patient was much exhausted from chloroform; so he was put to bed, my intention being to remove the second stone by suprapubic lithotomy should the boy recover from the operation he had undergone. During the first three days the boy passed urine freely, but with some dribbling. He had slight fever every evening, but on the whole was daily growing stronger.

On December 30 I found the lad in intense pain, with retention of urine. On passing a sound, I found that the stone had shifted its position, and was now lying in the bladder right up against its neck; the tumour in the groin had disappeared. The dislodging of the stone from the dilated ureter was due no doubt partly to the other stone, on which it rested, having been removed, and partly to the accumulation of urine behind it pushing it on into the bladder. Patient at once anæsthetized,

and litholapaxy again performed. The same instruments as before were used, and a stone of nearly the same size removed. The operation lasted one and a half hours, and the patient was much exhausted.

The débris (urates) removed at the first sitting weighed, when dry, 767 grains, and that at the second 681 grains—total, 1,448 grains, or more than $3\frac{1}{4}$ ounces. For the first three or four days the lad was very low, but on January 11 I had the pleasure of showing him to Surgeon-General W. R. Rice. He was sitting up in bed, quite happy; dribbling of urine had ceased, and his general health had much improved. All urinary symptoms had disappeared on January 20, and he was discharged on January 22 in fairly good general health, the spleen having diminished much in size. On January 28 I met the boy walking about in the streets.

It is in such cases as this that Bigelow's operation stands forth in brilliant contrast with all other operations for stone, rescuing from certain death miserable patients on whom no cutting operation of any kind could be undertaken with any hope of success.

This case illustrates the process of 'scraping and chipping'—if I may so call it—by which a lithotrite may be made to crush a stone of larger size than that for which the instrument was constructed. In this way comparatively large stones may be disposed of by small lithotrites, a matter of great significance when we have to deal with narrow urethræ in children. The process of scraping the sides of a stone is a very tedious and delicate one, and demands much care, patience, and perseverance for its successful accomplishment.

Females.—Amongst 1,361 operations for stone in the bladder performed by me, there were 31 in females, or about $2\frac{1}{4}$ per cent. of the whole. Three of these occurred in my lithotomy days, previous to my commencing litholapaxy. These three occurred in children, and the calculi were removed by rapid dilatation of the urethra. Since commencing Bigelow's operation 28 cases of stone in females have come under my treatment, and of these 27 have been treated by litholapaxy with entire success. The remaining case was that of a woman aged seventy. I attempted litho-

lapaxy, but the stone, which was uric and weighed exactly 2 ounces, was so extremely hard that, though it was easily grasped by my largest lithotrite, No. 18, I could make no impression on it, though I used all the force of which I was capable. The stone in this case I successfully removed by vaginal lithotomy.

Litholapaxy in females is, as a rule, not a difficult proceeding, the instruments employed being the same as for males. Even quite young female children admit large lithotrites and cannulæ without any preliminary dilatation of the urethra. The only special difficulty met with is that, owing to the width and shortness of the urethral canal, the water which is necessary in the bladder during the crushing of the stone is liable to rush out beside the instruments. This difficulty is obviated by getting an assistant to place the fore and middle fingers of one hand in the vagina, and to press the posterior lip of the urethra against the lithotrite or cannula, a manœuvre which prevents the water from flowing out. Litholapaxy in females is eminently successful, and the patient may be seen, as a rule, walking about the day after the operation. No forcible dilatation of the urethra being necessary, there is no incontinence of urine, that extremely troublesome sequel which sometimes follows the operation by dilatation. One woman from whom I successfully removed a calculus over an ounce in weight was seven months pregnant.

With my present experience of suprapubic cystotomy, I would remove a stone from the female by this method instead of by vaginal lithotomy or dilatation of the urethra, when litholapaxy is not practicable.

LECTURE XVIII

CUTTING OPERATIONS FOR VESICAL STONE

I. Lateral Lithotomy

WE now pass on to the subject of lateral lithotomy, an operation with a great historic past, and one which, though now almost entirely superseded by modern methods, particularly litholapaxy, was for centuries regarded as the most interesting and brilliant in surgery.

Cutting for stone is of remote antiquity, dating back certainly long before the Christian era. The earliest allusion to this operation is, I believe, to be found in the writings of Hippocrates, who flourished in the fifth century B.C. Celsus, who lived at the beginning of the Christian era, gives a detailed description of 'cutting on the gripe,' as the proceeding was called, and it is an interesting fact that the same operation is still practised in India by a type of itinerant native doctor unversed in European methods. I myself have had the curiosity to witness a successful operation of this kind by one of these 'specialists' on a boy aged five years. No anæsthetic was given, and the instruments were of the crudest kind. Two fingers of the left hand were introduced into the rectum, by which the stone was pushed down against the perineum and 'gripped' there: hence the designation cutting on the 'gripe' or 'grip.' A transverse incision was then made in front of the anus, extending down to the stone, which was extracted by a flattened blunt hook.

This operation was practised in Europe till the seventeenth century, when suprapubic lithotomy was introduced ; but in a short time the latter practically died out. About this period an ungrooved staff was employed as a rough guide to the knife. Later on a grooved staff was used, and the operation as it is now performed was practically brought to perfection by Cheselden, of St. Thomas's Hospital, in the early part of the eighteenth century.

The patient is prepared by having his bowels thoroughly cleared out by a purgative, in addition to which an enema is given a couple of hours before the operation. The perineum

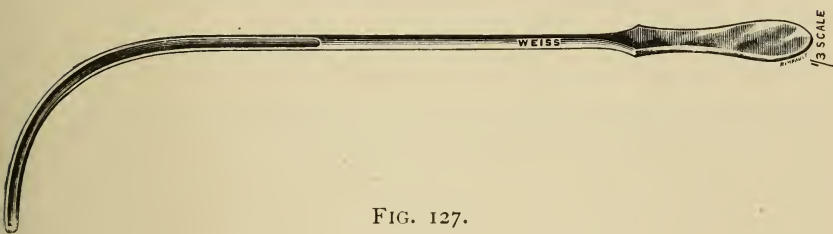


FIG. 127.

is shaved and purified, and an antiseptic dressing applied thereto.

The patient is placed on an operating-table of convenient height and anæsthetized. A gum-elastic or rubber catheter is then introduced, the urine drawn off, and the bladder washed out with warm boracic lotion till this flows clear. Six or seven ounces of the lotion are left in the bladder on withdrawal of the catheter. A staff of this shape (Fig. 127), with a deep groove extending along the left side of the curved portion to within an inch of its point, and of the largest size that the urethra will readily admit, is then passed into the bladder, when the stone should be felt. Should the staff fail to reveal the presence of the stone, it must be withdrawn and a sound introduced to ascertain the position of the stone. On reintroduction of the staff the stone will be located ; but

on no account should the operation be proceeded with till the stone is definitely felt by the staff, lest the latter may have failed to reach the bladder, owing to its possible diversion into a false passage in the urethra.

The patient is now placed in what is called the 'lithotomy position' (Fig. 128)—that is, on his back, with his thighs flexed on the abdomen and the legs flexed on the thighs, and with the buttocks projecting somewhat beyond the end of the table. He is held in this position by an assistant on either side. It was formerly the practice to bind the

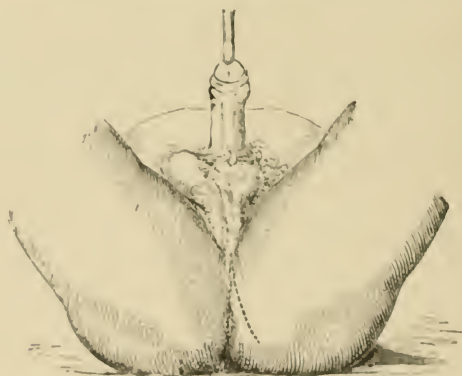


FIG. 128.—SUPERFICIAL INCISION IN LATERAL LITHOTOMY (FERGUSSON).

patient's hands and ankles together on either side, and in recent years a Clover's crutch has been employed for keeping the lower limbs in position. All these appliances savour of pre-*anæsthetic* days, when it was necessary to secure the patient from struggling during the operation. They one and all interfere with the introduction and securing of the staff in position, and hamper the patient's breathing. There is no fixation arrangement equal to the aid of a couple of skilful assistants for this purpose, who can extend or flex the patient's limbs as required, and keep the parts symmetrically placed during the operation.

The staff is placed with the shaft perpendicularly, and the concave aspect of the curved portion pressed against the roof of the urethra, beneath the pelvic arch, and then relegated to an assistant standing on one side, who with the second hand raises the scrotum up out of the field of operation.

The surgeon passes a finger into the rectum to ascertain that it is empty and acquire a knowledge of the size and general conformation of the prostate. Having purified his finger, he sits on a stool of convenient height facing the patient's perineum, and passes the fingers along the bony arch of the pelvis, so as to take in a mental grasp of the relative positions of the various structures.



FIG. 129.

The point of the knife (Fig. 129)—one with a stout blade 3 inches long, and with a straight back—is then entered $1\frac{1}{2}$ inches in front of the anus and slightly to the left of the central raphe, and an incision $2\frac{1}{2}$ to $3\frac{1}{2}$ inches long, according to the stoutness of the patient, boldly made outwards and downwards to about an inch beyond the anus, in such a direction that it intersects an imaginary line drawn from the ischial tuberosity to the anus at the junction of its middle and outer thirds. By this incision, which should be deeper towards the centre than at the ends, the skin and subcutaneous tissues are freely divided; but no attempt should be made to reach the staff in the first instance. The knife is applied once or oftener to the exposed fat and cellular tissue, and the forefinger of the left hand is then introduced deeply into the wound between the accelerator urinæ and the erector penis muscles, when the groove in the staff will be felt at the

membranous portion of the urethra. The finger-nail is fixed in the groove as far back as possible to protect the bulb. The blade of the knife is then passed along the back of the finger, with its edge directed outwards and downwards, and the membranous urethra incised, so that the point of the knife is felt grating against the groove of the staff (Fig. 130). Keeping the point of the knife carefully in the groove, it is pushed along till it reaches the bladder, cutting through the side of the urethra and notching the left lobe of the prostate. On withdrawal of the knife the incision is enlarged

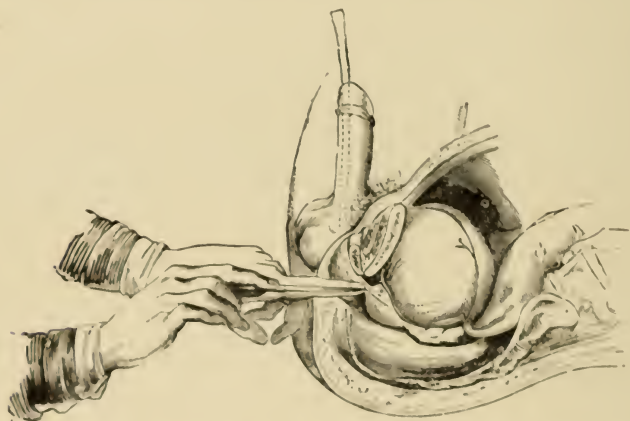


FIG. 130.—DEEP INCISION IN LATERAL LITHOTOMY (FERGUSSON).

downwards and outwards to an extent proportionate with the estimated size of the stone.

The forefinger of the left hand is then passed along the staff into the bladder, dilating the wound in its progress. When the surgeon is assured that the finger has reached the bladder, either by his feeling the stone or by the sensation of its lying in a large smooth-walled cavity, the staff is withdrawn. The neck of the bladder and the deep wound are then further dilated by twisting the finger about, and the stone is located if it has not already been felt lying,

as it usually is, close up against the inner orifice of the urethra.

Forceps of this kind (Fig. 131)—of which several pairs of various sizes, some straight and others curved, with spoon-shaped blades roughened on the concavity, should be at hand—are then passed along the finger, and as their point enters the bladder the finger is slowly withdrawn, and the blades are at the same moment opened, when a gush of lotion will take place, and frequently the stone be carried into the jaws of the instrument. Should the stone not be thus caught at once the instrument is moved about in search of it,

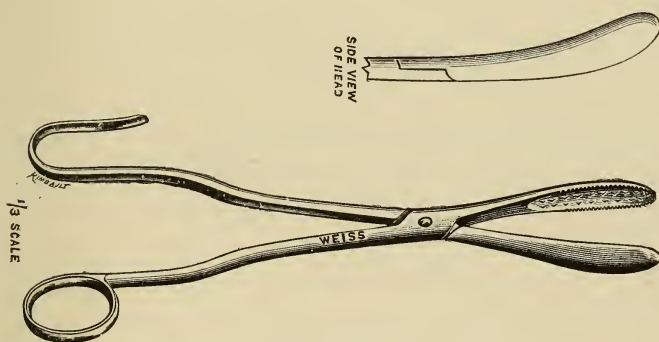


FIG. 131.

the blades being gently opened and shut, over and over again perhaps, till the stone is secured. Before attempting to withdraw the stone the forceps are moved about in the bladder to ascertain that they are free, lest a fold of the mucous membrane should be engaged in their grip.

The forceps with the contained stone are then gently withdrawn by a side-to-side alternating with a rotatory movement, downwards and backwards first and then forwards and upwards, in the axis of the pelvic outlet, avoiding pressure on the upper aspect of the urethra beneath the pelvic arch. If there be much obstruction to its advance the finger should

be introduced beside the forceps to ascertain that the stone is grasped by its long axis, if it be an elongated one. If the stone be large a certain amount of force will be required for its extraction, but enlargement of the wound by the knife is preferable to bruising of the tissues at the neck of the bladder by the employment of much force.

On the removal of the stone the finger should be re-introduced and the bladder thoroughly explored to ascertain if a second or more calculi be present. Pressure on the hypogastrium with the other hand will bring the distal portions of the bladder within reach of the finger.

If the stone be broken during extraction, as is frequently the case when it is phosphatic, or if several small calculi be present, a scoop (Fig. 132) will be found more convenient

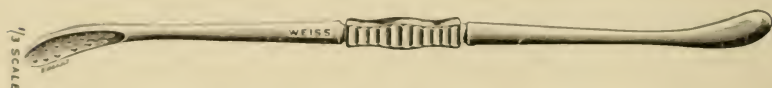


FIG. 132.

than forceps, the débris or calculi being held between the scoop and the tip of the forefinger in extraction.

There may be considerable hæmorrhage from the superficial perineal arteries, the deep branches of the pudic, particularly that which courses inwards to the bulb, or from the prostate. Superficial vessels are ligatured, and the deep ones also when practicable; should there be any difficulty about this, catch-forceps may be applied and left in position for a day or two. Prostatic bleeding is best arrested by introducing a large stiff rubber drainage-tube, and packing the wound around this with iodoform gauze if necessary. I have seen very profuse hæmorrhage into the bladder in my early lithotomy days in old men with enlarged prostates. Such cases are now, of course, treated by suprapubic removal of the stone and prostate.

The operation as just described is that which I practised in my early lithotomy days in India. Later on I abandoned the curved staff in favour of a practically straight one (Fig. 27, but without the guide), resembling Key's, save that the end is somewhat more curved for facility of introduction. The groove is median, and extends just as far as the bend.

Further, after making the superficial incisions in the perineum, I assume charge of the staff, holding it in my left hand whilst I pass the knife along its groove into the bladder. The sympathy between the two hands enables one to judge of the position of the groove, and at once strike it off with the point of the knife.

Some surgeons are in the habit of laying aside the sharp-



FIG. 133.

pointed knife when the groove in the staff has been reached, and completing the incision by means of a probe-pointed knife (Fig. 133) slid along the groove, by this means obviating the possibility of injuring the bladder with the point of the scalpel. For the novice this is a wise precaution, but unnecessary for the practised lithotomist, particularly if the bladder contains a considerable quantity of fluid, as it always should do before commencing the operation.

If the patient be very stout or the prostate enlarged, the finger may fail to reach the bladder. This useful instrument (Fig. 134), a gorget with blunt edges, is in such cases passed into the bladder along the groove of the staff, which is then withdrawn, and the forceps introduced along the concavity of the gorget.

An imperative precaution during this operation is—*always*

to have some guide in the bladder (whether staff, finger, gorget, or forceps), and never to withdraw one till another is fairly in that viscus ; otherwise you may fail to reach the bladder, an unfortunate accident likely to be attended by disastrous results.

The rectum is liable to be wounded during this operation. This accident is obviated by taking care that the lower bowel is thoroughly emptied before the operation, by keeping the staff well up against the pubic arch, and by directing the edge of the knife outwards, away from the anus in the direction already indicated. Should this accident occur, the wound is simply allowed to granulate without any active interference.

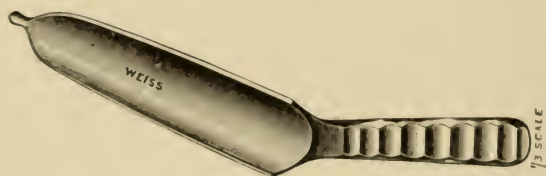


FIG. 134.

The operation being completed, a stout perineal drainage-tube of stiff rubber (Fig. 28) is inserted in the bladder, and retained in position by means of a suture of silkworm gut passed through it and the margins of the wound. The edges of the wound, if extensive, may be partially brought together by means of a suture or two. The bladder is then washed out through the tube with warm boracic lotion to remove any clots of blood or grit that may be lying there. The tube is removed in the course of three or four days, when the urine passes by the wound for some days. The surface of the wound will have begun to granulate and be covered by plastic lymph, thus preventing absorption from septic urine. Urine will begin to pass by the urethra at periods varying from one to three weeks. In aged patients the

subjects of prostatic enlargement the period was much longer; but cases of this kind would now, as already explained, be dealt with suprapubically.

The bed in which the patient is placed is, of course, protected by waterproof sheeting, and absorbent cotton-wool and cellulose are thickly packed beneath the buttocks and along the perineum, being kept in position by a broad bandage. The dressings should be changed every three or four hours, when saturated with urine. The usual precautions should be taken to prevent the skin in proximity to the wound getting irritated by the urine.

Modifications of the Operation in Male Children.

In male children the largest staff that can be introduced with facility should be employed. Owing to the undeveloped condition of the parts and the delicate nature of the tissues, there may be some difficulty in introducing the finger into the bladder, and if force be used the prostate and bladder may be pushed off the urethra up into the pelvis. To obviate such an occurrence a small blunt gorget (Fig. 23) should be passed along the staff into the bladder, and by this the wound is dilated. On withdrawal of the staff the finger can be introduced; or the forceps, which should be very slender, can be slipped along the gorget into the bladder.

In children a tube is unnecessary and irksome. The urine is allowed to flow by the wound from the first. Granulation takes place rapidly in them, so that the wound is frequently completely closed in a week or ten days.

II. Median Lithotomy.

For this operation a curved staff with central groove is generally employed. An incision is made through the skin and subcutaneous tissues in the central line of the perineum,

commencing 2 inches in front of the anus and extending downwards almost to its edge, merely cutting through the skin at the lower part of the wound. The forefinger of the left hand is then passed deeply into the wound, and the groove of the staff is felt in the membranous portion of the urethra. The point of a long, slender, straight bistoury, with its edge downwards, is passed along the finger till it enters the groove of the staff, and is then slid along it, cutting through the membranous urethra and nicking the apex of the prostate. No extensive wound of the prostate is necessary or desirable, as the prostatic portion of the urethra is roomy, and dilatable by the finger to such dimensions as will permit the withdrawal of any stone that can be removed by this method.

A blunt-edged gorget (Fig. 134) is passed into the bladder along the groove in the staff, which is then withdrawn. The finger is now passed into the bladder along the gorget, which is in turn withdrawn. Then the forceps are passed along the finger, and the stone is caught and removed, as already described in connexion with the operation of lateral lithotomy.

Personally I always use the straight staff (Fig. 27), which I hold in my left hand, and at once enter the knife straight into its groove, without any preliminary incision of the skin, cutting through the superficial parts as the knife is withdrawn.

A rubber perineal tube is tied in the bladder for two or three days, after which the urine is allowed to flow by the wound till it closes. The after-treatment is the same as for lateral lithotomy.

Only calculi of comparatively small sizes can be removed by this method, and such are best dealt with by litholapaxy. This operation should be reserved mainly for those cases in which the stone is impacted in the prostatic urethra, or growing partly there and partly in the bladder (Fig. 106), and

which cannot be dislodged backwards into the bladder for removal by litholapaxy.

There is scarcely any bleeding unless the bulb is encroached on during the incisions.

The operation is frequently performed by inserting the knife with its back downwards in front of the anus, and cutting in an upward direction on the staff, the forefinger of the left hand being placed in the rectum. I consider the other method superior.

III. Suprapubic Lithotomy.

Though the suprapubic operation for stone in the bladder dates back to the sixteenth century, it never till in recent years acquired a permanent or extensive footing in surgery, but was merely had recourse to for the removal of very large calculi which could not be dealt with by any other method. Needless to say that under such restrictions the mortality attending it was something appalling. The two sources of recognized danger in connexion with this operation were—the prospect of opening the peritoneum, and the occurrence of pelvic cellulitis from urinary infiltration.

In the year 1878, Garson, by experiments on the dead body, demonstrated that, by inflating a rubber bag placed in the rectum and distending the bladder with fluid, the peritoneum covering the apex of that viscus is raised to such an extent from the pelvic symphysis that the bladder can be opened in the prevesical space without injury to the peritoneum. Petersen of Kiel was the first, in 1880, to operate in accordance with the suggestion of Garson.

Though the rectal bag has since been abandoned as unnecessary and, indeed, dangerous, there is no doubt that the experiments referred to had the effect of redirecting attention to the suprapubic operation, and of giving it an impetus which has increased in strength year by year, so

that in Europe at least lateral lithotomy has almost died out, practically all cases of stone not dealt with by litholapaxy being now removed by suprapubic lithotomy.

The operation of suprapubic cystotomy, by which the stone is reached and extracted, has already been described in detail in the lecture on tumours of the bladder (p. 228). The bladder having been opened in the manner there indicated, the stone is located by the index-finger of the left hand. Lithotomy forceps (Fig. 131) are then introduced, the stone is caught between the blades, and gently withdrawn through the wound.

The extent of the wound in the bladder will depend on the size of the stone. Should it be necessary to enlarge the wound first made by the knife, this is best done by introducing the two index-fingers and gently tearing the bladder wall by separating them to the required extent. In this way hæmorrhage is reduced to a minimum. It is better to enlarge the wound than to use undue force in extraction of the stone, by which the bladder walls would be bruised, thus probably leading to sloughing of the tissues.

When the stone is small, or if several be present, the scoop (Fig. 132), aided by the point of the index-finger in the bladder, will be found more efficient than forceps. Should the calculus be phosphatic it will probably break up during extraction, in which case all the débris must be carefully removed by the scoop, and by flushing out the bladder with warm lotion.

On completion of the operation a stout drainage-tube is introduced into the bladder and fixed in position by a suture. Around this the edges of the abdominal wound are loosely brought together; and, speaking generally, the after-treatment is similar to that already described in connexion with suprapubic removal of the prostate and vesical growths.

LECTURE XIX

THE AUTHOR'S EXPERIENCE OF OPERATIONS FOR STONE IN THE BLADDER, WITH COGNATE STATISTICS

IN the foregoing lectures I have endeavoured to give a clear and concise description of the various operations employed for stone in the bladder. I now propose placing before you the results of my own experience of these operations, with some cognate statistics.

It has fallen to my lot to have performed, I believe, a greater number of operations for stone than any surgeon in the past or present—at least, outside India; and in one respect my experience is unique—in that I am the only surgeon who has had large practice in this direction both in India and in England.

During my Indian career I published papers in the medical journals from time to time,* giving full details of several successive series of operations for stone. Careful notes of every case, both in hospital and private practice, have been kept. In the vast majority I have had the pleasure of operating in the presence of other surgeons, and showing them the results. There was no selection of cases, my rule being to operate on every patient suffering from

* *Indian Medical Gazette*, December, 1882; February, 1883; March, 1884; April, 1885; January, 1886; February, 1886: the *Lancet*, February 28, March 7 and 14, 1885; *British Medical Journal*, December 24, 1887; October 12, 1889; May 9, 1891; July 16, 1894.

stone coming under my care, no matter in what condition. It is hoped, therefore, that this record may prove interesting, though I am conscious of the fact that it is difficult to infuse interest into the dry statistics of any subject.

I have now performed 1,358 operations for stone in the bladder by all methods—viz.:

Perineal lithotomy	...	...	...	252
Suprapubic lithotomy	...	...	...	116
Vaginal lithotomy	...	...	...	1
Rapid dilatation of the urethra in females	...	...	...	3
Litholapaxy	...	...	...	986
Total				1,358

Of these, 864 were performed in India, and almost entirely amongst the natives of that country; 494 were done in England, and, with few exceptions, on Europeans.

As stated in a previous lecture, 31 of these operations were performed on females—viz., 27 by litholapaxy, 1 by vaginal lithotomy, and 3 by rapid dilatation of the urethra—all successfully.

Amongst the 252 perineal lithotomies there were 11 deaths—viz., 52 adults, with 10 deaths, and 200 children, with 1 death, giving a mortality of 4·36 per cent. on the whole, or 19·23 per cent. in adults and 0·50 per cent. in children. There were only 8 perineal lithotomies done in England, all successfully, 244 having been performed in India. The former number is so small that no conclusion carrying any weight can be drawn from these statistics as to the relative safety of this operation in the two countries.

The cause of the very large proportion of children submitted to lithotomy as compared with adults is due to the fact that between 1882 and 1886—part of the most active period of my stone surgery in India—I confined litholapaxy

to adults, all children being cut for stone. After the latter date I extended litholapaxy practically to all children as well as to adults.

The 116 suprapubic lithotomies were all performed in adults, and amongst these there were 11 deaths, or 14·65 per cent. In 86 of these the enlarged prostate was enucleated at the same time—in fact, the prostatectomy was regarded as the main operation, and the entire mortality accepted as arising therefrom, though now again referred to in connexion with suprapubic lithotomy.

The average age of these 86 cases was 65·66 years, and the mortality 13·95 per cent. In the remaining 30 cases, with an average age of 54·8 years, there were 5 deaths, or 16·16 per cent. It would thus appear that, whilst the complication of stone adds greatly to the danger of prostatectomy, the removal of the prostate in addition to the stone actually reduces the mortality of the operation regarded as suprapubic lithotomy.

There were only 6 suprapubic lithotomies in my Indian experience, with 2 deaths, or 33·33 per cent., the remaining 110 operations having been done in England. Here again the former number is so insignificant as to render any conclusion as to comparative mortality nugatory.

The weights of calculi removed by lithotomy in India varied from $1\frac{1}{2}$ grains to $12\frac{1}{2}$ ounces, the average weight being 239 grains. In England they varied from 3 grains to $14\frac{1}{2}$ ounces, with an average weight of 251 grains. The largest stone removed by lateral lithotomy weighed $3\frac{1}{2}$ ounces.

Amongst the 986 litholapaxy operations there were 28 deaths, or 2·53 per cent. Of these 796 were in adults, ranging from 17 to 96 years, and amongst these there were 23 deaths, or 2·88 per cent. There were 190 children, aged from $1\frac{1}{2}$ to 16 years, with 2 deaths, or 1·05 per cent.

Contrasting my experience of litholapaxy in India with

that in England, there were 11 deaths in 610 litholapaxies in India—viz., 439 adults, with 9 deaths, and 171 children, with 2 deaths, giving a mortality of 1·80 per cent. on the whole, or 2·05 per cent. in adults and 1·17 per cent. in children. There were 376 litholapaxies in England, with 14 deaths, or 3·72 per cent.—viz., 357 adults, with 14 deaths, or 3·89 per cent., and 19 children, all successful.

The somewhat higher death-rate from litholapaxy amongst adults in England than in India I attribute to the much greater age of the former, the average age in India being 48·50 and in England 58·33 years, and also to the fact that enlarged prostate complicated the operation much more frequently in England than in India.

On the other hand, the average weight of calculi removed in India by litholapaxy was much greater than in England. In India the calculi in adults ranged from a few grains to 6½ ounces, the average being 262 grains; in England the average weight was 122 grains, the largest being a little over 3 ounces. In children the calculi in India varied from 2 grains to 3¼ ounces, with an average of 95 grains; in England the average weight was 44 grains, the largest being ¾ ounce.

These 986 operations were performed in 914 individuals, the disease having recurred once in forty-one instances, twice in seven instances, four times in three instances, and thirteen times in one case. After performing litholapaxy successfully fourteen times in this last case, I eventually removed his enlarged prostate, and he is now in excellent health, untroubled by any urinary symptom.

The recurrences of stone were mainly due to re-formation of phosphatic calculi in diseased bladders of elderly men suffering from enlarged prostate. This is now obviated by the enucleation of the prostate. In several instances there was a distinct history of renal colic after the first operation,

followed by recurrence of vesical stone. In only three or four instances could the recurrence be traced to a fragment having escaped removal at the first operation.

Recurrent stone is, I believe, equally common after litholapaxy and lithotomy.

From the foregoing statistics it will be seen that the introduction of the modern operation of litholapaxy has had a vast influence in ameliorating the sufferings and diminishing the mortality attendant on this painful disease. Even in children, though lithotomy had always been a comparatively successful operation, litholapaxy has the great advantage of being followed by a much shorter period of convalescence. Indeed, the period in hospital after this operation, whether in children or adults, may be counted in days instead of weeks after the cutting operation.

Though I have been singularly fortunate in my lithotomy operations in children, the mortality attending the perineal operations in the adult in my hands approximates to that recorded in hospital practice both in England and in India. Thus, Sir Henry Thompson collected details of 1,827 lithotomies performed in British hospitals previous to the introduction of litholapaxy, showing 229 deaths, or 12·50 per cent. There were 1,028 children with 68 deaths, or 6·5 per cent., and 799 adults with 161 deaths, or 20 per cent. In a paper published in the *Lancet*, March, 1885, I gave statistics of 2,592 lateral lithotomies performed in Indian hospitals in 1882, showing a mortality of 13 per cent. on the whole—practically the same as in British hospitals.

From 1864 to 1906 there were 1,434 operations performed in St. Peter's Hospital for stone in the bladder, and the introduction of litholapaxy has been followed by a gradual decline in the death-rate from over 15 per cent. in the first decade to 4·16 per cent. in 1906.

I had the honour of being one of the pioneers of Bigelow's

operation in India, and, I believe I may say, of influencing largely its general adoption in surgery all the world over. The early history of litholapaxy—the incredulity with which its results were received, the prejudices and misrepresentations encountered—reminds me of the opposition my own operation of total enucleation of the prostate encountered on its introduction to the profession. Though Bigelow's operation was placed before the medical world in 1878, it did not make much headway for some years. In the *Lancet* of February 28, March 7 and 14, 1885, I published details of my first series of 111 cases, and the results obtained put an end once and for all to those theoretical objections and gloomy forecasts put forward by surgeons brought up in the prejudices of the old school of lithotrity, and demolished the opposition to Bigelow's claim to originality.

Commenting on this paper at the time, the *New York Medical Record* remarks: 'Even in India, one surgeon, Freyer, has performed it (litholapaxy) oftener than, may we not say? all the surgeons in the Western, Middle, and Southern States,' thus indicating the slow progress made by Bigelow's operation even in his own country during the first seven years after its introduction.

To sum up, though litholapaxy is the operation advocated, as a rule, in patients of all ages and both sexes suffering from stone in the bladder, there must always remain a small proportion of cases in which this operation is inapplicable. These may be summarized as follows:

1. When the stone is extremely large and hard.
2. In some cases of encysted calculus, particularly when the sac is narrow-mouthed.
3. When the calculus is partially impacted in the prostatic urethra, and cannot be displaced backwards into the bladder.
4. When the bladder is contracted, rigid, and irritable,

resenting the presence of water, and not allowing room for the manipulations of the lithotrite.

5. When the stone co-exists with tumour of the bladder, and it is desirable to empty the bladder of both growths at once.

6. When tight fibrous stricture of the urethra complicates the case.

7. Where much enlargement of the prostate co-exists, or the stone is the result of this enlargement.

In such cases lithotomy of some kind must still be had recourse to; and the variety of lithotomy—whether lateral, median, or suprapubic—will depend on the circumstances of the case. As the surgeon gains experience of litholapaxy the number of cases in which the knife will be necessary will gradually diminish.

LECTURE XX

RENAL CALCULUS

THE kidney may be the seat of any of the types of urinary calculi already described. The uric acid is the variety most commonly met with; then in order of frequency come the oxalates of lime, the urates, and the phosphates. Calculi occurring secondarily to disease of the kidney or of the renal pelvis are invariably composed of phosphates; and when septic changes set in subsequent to the formation of one of the other types, this latter rapidly increases in size, as a rule, by the deposit on its surface of phosphates.

Calculi may have their origin in the pelvis of the kidney, the calyces, or the tubuli uriniferi.

Renal calculi may be single or multiple, smooth or rough, fixed or movable. When multiple they are frequently faceted. They sometimes attain to enormous dimensions, filling and expanded the pelvis and throwing up branches like coral into the calyces (Figs. 135, 136).

As a rule only one kidney is involved, but both organs are not unfrequently affected by stone. The disease is rare in children. It is more common in males than in females.

The chief causes of renal calculus are: a sedentary life, excess of nitrogenous diet, residence in localities yielding hard drinking water, and inflammatory conditions of the pelvis and calyces of the kidney.

Symptoms.

Pain in the loin corresponding to the affected kidney is, as a rule, the earliest, as it is the most constant symptom. In the primary stages of the malady the pain assumes the form of periodic attacks of what is commonly known as 'renal colic.' In a typical attack of this kind the pain commences in the loin, then shoots down the corresponding groin, along the course of the ureter, into the bladder, and frequently into the testicle in the male, or labium majus in the female. The testicle is generally retracted and may be swollen and tender. The pain may also radiate down to the thigh, and across the abdomen towards the other kidney. Generally speaking, the pains radiate along the branches of the lumbar plexus of nerves.

The pain varies in intensity in different individuals, and at different periods in the same person. It is sometimes slight, or of moderate degree; more frequently it is excruciating, causing the patient, bathed in profuse perspiration, to roll about in agony, making ineffectual attempts to ease his distress by change of position. It may be so severe as to necessitate frequent hypodermic injections of morphia, or even the employment of a general anæsthetic for its relief.

The attacks of renal colic are almost invariably accompanied by gastro-intestinal disturbances—namely, nausea, vomiting, and perhaps purging.

They are also, as a rule, attended by reflex disturbances of the urinary tract—viz., pain or scalding in the urethra, increased frequency of micturition, scantiness or even partial suppression of urine, due either to obstruction to the flow of urine or inhibition of the functions of the affected kidney, or even of the sound kidney on the other side.

As the attack passes off the kidneys resume their functions, and immediately on its subsidence the volume of urine is greatly increased.

The attack of renal colic may pass off in an hour or two, or continue for two or three days. Sometimes it comes to an abrupt termination by the stone passing down the ureter and out through the urethra. Or the stone may be arrested in the bladder, a new train of symptoms, namely, those of vesical calculus, setting in.

As the disease progresses the intervals of freedom from suffering diminish in length, and the accessions of lumbar pain, as a rule, increase in intensity. But eventually, after the malady has lasted for a lengthened period, perhaps two or three years, the typical renal colic attacks gradually subside, to be replaced, however, by pain of a dull, heavy, aching, or gnawing character fixed in the loin.

Now, how is this change in the character of the pain accounted for? It is attributable to the following circumstances: When the stone is small, and lies loosely in one of the calyces, by some sudden jar or movement of the body it is shaken into the pelvis, and is forced down the ureter by the accumulation of urine above. Obstruction to the flow of urine and pressure on the nerves are thus caused, giving rise to the distressful condition already described, till, by some movement or position of the body, the stone gets displaced backwards again, when the symptoms suddenly cease.

As the stone grows in size it has a tendency to get fixed in one of the calyces, thus ceasing to block the ureter and obstruct the flow of urine; or, lying in the pelvis, it may gradually throw up coral-like branches into the calyces like these specimens (Figs. 135, 136), which I show you from my own practice, one of which (Fig. 135) recalls to you Henle's cast of the pelvis and calyces of the kidney. When calculi attain this size, they as a rule cause little pain while the patient is at rest, owing to the fact that they are fixed in the kidney, and probably surrounded by thick muco-pus.

A very large stone, like one of these specimens, can occasionally be felt on palpation through the loin.

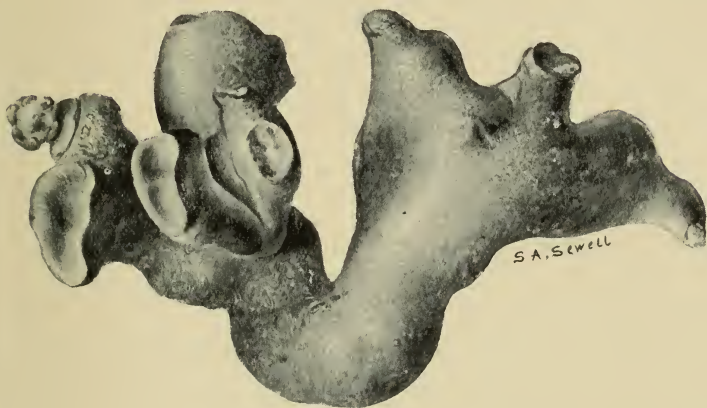


FIG. 135.



FIG. 136.

A typical, almost pathognomonic, characteristic of the pain due to renal calculus is that it is brought on or increased

by exercise, particularly riding on horseback, and diminished by rest.

When the attacks of renal colic have continued for some time, another symptom of not less significance—namely, hæmaturia—sets in. Sometimes, though rarely, periodic hæmaturia may be the first symptom noticed by the patient, the lumbar pain supervening later on.

The hæmaturia occurs in connexion with the attacks of renal colic, setting in shortly after the pain commences, and continuing some hours, perhaps a day or two, after it ceases, the urine then becoming gradually clear, and remaining so till the next accession of pain.

As a rule, the quantity of blood passed is not large. Profuse hæmorrhage is not characteristic of renal stone. The urine will vary in colour, according to the proportion of blood it contains, from a faint pink to a deep red. Frequently, in patients suffering from stone in the kidney, when the urine is quite clear to the naked eye traces of blood will be discovered by the aid of the microscope.

Like the pain of renal calculus, it is typical of the hæmorrhage that it is increased by exercise and diminished by rest. It is in the early years of the disease that this symptom is most marked. In the later stages, when the stone has grown to such a size that it is fixed in one of the calyces or imbedded in the kidney substance, and enveloped by thick muco-pus, there is rarely any hæmaturia, unless the patient be subjected to severe jolting or direct pressure on the kidney.

With the presence of these two characteristic symptoms—pain in the loin and hæmaturia—your suspicions will at once be directed to the existence of stone in the kidney; and on palpation of the loin it will probably be found, if the disease has existed for some time, that there is a tumour in this region of the abdomen, reniform or ovoid in shape,

smooth on the surface, more or less movable, but bound down or anchored behind. On deep inspiration it will probably move downwards to the extent of an inch or more, returning upwards partially under the ribs on expiration. This tumour is, of course, an enlarged kidney, due to congestion or inflammation of that organ from the irritation of the contained calculus. In thin subjects, and particularly in women, this enlarged kidney will be easily and distinctly felt. If the fingers of one hand be pressed deeply in the loin, and those of the other be placed on the abdomen in front below the ribs, you will probably be able to roll the tumour slightly about its fixed point. In fat subjects, and when the kidney is placed high up under the ribs, as it sometimes is, it will often be impossible to feel the enlarged organ. In the early stages of the disease, before congestion or inflammation of the organ has set in, there will be no tumour felt, the kidney not being sufficiently enlarged to render its presence manifest on palpation.

During these manipulations another important symptom will be elicited—namely, tenderness in the loin. This will in some cases amount to acute pain. Nausea will also probably be induced by palpation of the kidney.

Even in the early stages of the malady, when there is no apparent enlargement of the organ, palpation of the loin will elicit tenderness at some particular spot. A characteristic symptom of renal calculus is a sharp, stabbing pain, felt when the fingers are pressed deeply in the ileo-costal space, just outside the margin of the erector spinæ muscle. A somewhat similar pain is produced by pressing the fingers into the abdomen at a point midway between the navel and the anterior superior spine of the ilium, indicating, probably, that the stone lies in the pelvis of the kidney or its vicinity.

Turning our attention now to the urine, apart from the presence in it of blood already dealt with, in the early

period of this disease you will frequently discern the existence of albumen. In the later stages this is invariably found.

Pus in the urine is an important symptom. Though generally absent in the early history of renal calculus, it is almost invariably present in the later stages of the disease, due to the pyelitis or suppurative nephritis set up by the irritation of the stone. As a rule, the urine is acid in presence of this pus, but occasionally it is alkaline.

When the stone has existed for years, has attained large dimensions, and has caused much destruction of the kidney tissue, pus may be passed in enormous quantity. Under such circumstances there will be febrile disturbances, profuse sweats, with loss of flesh and strength.

Mucus is frequently present in large quantity where the urine contains pus as the result of stone in the kidney. In the early stages of renal calculus in young persons, mucus may be present without the existence of pus.

Microscopically, crystals of uric acid, oxalates, or phosphates will probably be found, and, apart from the significance of this symptom as confirmatory of the presence of stone in the kidney, will give a clue as to its composition.

These, then, are the symptoms of renal calculus. It is rare that you will find them all present in any particular case. A combination of a certain number of them will afford you ample grounds for arriving at a correct diagnosis. Calculi embedded in the cortical portion of the kidney may exist for years, and give rise to no symptom beyond, perhaps, some aching in the loin.

There are, however, some cognate considerations that will assist us in arriving at a correct diagnosis. For instance, the previous passage of one or more calculi would be a strong confirmatory indication of renal calculus.

Then, again, you should inquire as to whether there is any

history of injury to the kidney, for traumatism, when accompanied by the effusion of blood into the substance of the gland, is not unfrequently followed by the development of stone.

If the patient has resided in a locality favourable to the formation of stone, this should be taken into consideration. It is well known that residence in certain localities, such as Norfolk, strongly favours the development of urinary calculi.

Lastly, heredity should be inquired into, for stone and those diatheses that favour its formation are hereditary in families. In 1899 I successfully removed renal calculi from a young artillery officer and his mother; and the father of this lady had died from stone. Some years ago, in India, I removed by litholapaxy calculi from three generations—son, father, and grandfather.

The Roentgen rays have been much employed in recent years for the purpose of diagnosing renal calculus, and with considerable success. When the stone is large, and particularly when it is composed of oxalates or phosphates, which give a dark shadow picture, the results are, as a rule, satisfactory. They are less so when the stone is uric acid, owing to the shadow being less defined or absent. The circumstances which militate against the success of this method of diagnosis are: the stone being small, the patient being stout, the movements of the kidney during respiration blurring the image, the shadow cast by the stone being concealed by that of the bones, and the calculus being uric acid—any one or more of which may render the method nugatory. When a distinct isolated shadow of the shape of a stone is shown, you may be pretty certain that there is one present, unless the shadow be caused by an intestinal concretion or calcified tuberculous gland. But negative evidence as to the presence of a stone by the X rays should not deter you from exploring

the kidney by operation when the symptoms of stone are well marked.

Cystoscopic examination in doubtful cases is frequently helpful. Not alone does it enable us to definitely exclude bladder conditions as the cause of the symptoms, but it may give us positive evidence of the presence of stone in the kidney; for in this malady the ureteral opening on the affected side is frequently distorted, irregular, puckered, pouting, or displays a prolapse of the ureteral mucous membrane—conditions due to the constant straining to get rid of the stone. Besides, we may observe blood or pus issuing with the urine from the ureter, especially if the affected kidney be squeezed between the hands of an assistant.

Treatment.

The treatment in the early stages of the disease consists in the adoption of measures for the relief of the symptoms attendant on renal colic, and to facilitate the passage of the stone through the ureter. These consist in the administration hypodermically of morphia combined with atropin every three or four hours to relieve pain, hot baths, hot fomentations to the affected loin, rapidly acting purgatives, and copious draughts of demulcent drinks containing an alkali. In some cases the pain is so severe as to require the administration of a general anæsthetic till the stone passes down, or falls back into the renal pelvis.

Patients who are in the habit of passing small calculi attended by attacks of renal colic should have dietetic and hygienic treatment to prevent the formation of stone. This consists in the taking of active exercise; avoidance of excess of nitrogenous food, sugar, and rich pastry; total abstinence from stimulants; the daily use of saline laxatives, particularly the natural mineral waters containing sulphates of soda and magnesia; and the administration of urotropin

(10 grains three times daily), which has a solvent action on uric acid, in large quantities of water of the Contrexéville type. I know of nothing so beneficial in such cases as an annual course for a month or so of Contrexéville water.

Renal colic may be due to other causes than stone—viz., kinking of the ureter due to movable kidney, a valvular formation closing the mouth of the ureter, stricture of the ureter, inflammatory or venous congestion of the ureter, or blockage of the ureter by a blood-clot, thick inspissated muco-pus, or a detached fragment of renal growth. Speaking generally, the treatment of all these forms of renal colic is the same.

When the measures above indicated fail to relieve the symptoms in the early stages of the disease, or if the patient comes under observation at a later period when the symptoms of renal calculus have existed for some time and are definite and pronounced, surgical interference should not be delayed; for the existence of a stone, even a small one, in the kidney is always attended by danger, owing to its tendency to induce one or other of the following conditions: (1) Hydronephrosis from blocking of the ureter by the stone, the kidney being eventually converted into a mere sac containing urine (Fig. 140); (2) pyonephrosis, the kidney being ultimately converted into a bag of pus; (3) chronic nephritis; (4) suppurative pyelitis, in which the inflammatory process is confined to the renal pelvis; (5) pyelonephritis, commonly known as 'surgical kidney' (Fig. 137), in which the inflammation involves both the pelvis and renal substance; and (6) anuria, due to the reflex inhibitory action of the stone on the functions of both kidneys. The operation for removal of stone from the kidney is termed

Nephro-lithotomy.

For the operation of nephro-lithotomy the patient is placed on the operating-table, lying on the sound side with

an inclination towards the semi-prone position, the leg and thigh corresponding to the affected kidney being partially flexed. A sand-bag is placed transversely beneath the loin, so as to separate as far as possible the crest of the ilium



FIG. 137.

from the costal margin, and render the affected kidney prominent in the loin. The kidney is then exposed by an oblique incision 4 or 5 inches long, according to the stoutness of the patient, commencing at the outer border of the

erector spinæ muscle, $\frac{1}{2}$ inch below the last rib, and extending downwards, forwards, and inwards, towards the anterior-superior spine of the ilium. The first incision is carried through the skin and subcutaneous tissues down to the muscles, which are divided by successive strokes of the knife till the fatty capsule of the kidney is seen protruding through the centre of the wound. The incision is best completed by means of angular scissors, two fingers being introduced through the limited incision in the transversalis fascia to push the colon and peritoneum out of the way.

The structures divided are: the skin and subcutaneous tissues; the latissimus dorsi and external oblique muscles, to about an equal extent; the internal oblique, through the whole extent of the incision; the fascia lumborum and some fibres of the transversalis muscle; and the transversalis fascia. The quadratus lumborum, which is visible in the posterior aspect of the wound, should not be incised in the first instance, though this may be necessary later on in some cases to afford more room.

Any bleeding vessels are clamped, and the larger ones ligatured. It will be well to get rid of all clamp-forceps before proceeding to incise the fatty capsule of the kidney.

The kidney is now pushed up into the wound by the hands of an assistant, placed on the abdomen. The colon frequently comes into view in the anterior portion of the wound, and should be pressed forwards out of the way by the fingers of an assistant or a broad retractor. The fatty capsule of the kidney is pinched up by forceps and incised by scissors or scalpel, when the canary-yellow-coloured fat surrounding the kidney protrudes. The tips of the two forefingers are introduced through this incision and the fatty capsule torn through by separating them, and detached from the outer aspect of the kidney.

The forefinger is passed along the back and then the front

of the kidney, palpating it all over, to ascertain if a stone be present. This will be felt as a hard nodule in the substance of the gland. The kidney should be compressed all over between the forefinger and thumb for the same purpose. Particular attention should be directed to the pelvis and infundibular portion, for these are the situations in which the stone is most frequently located. The upper inch or two of the ureter should also be palpated lest the stone lie in this position.

It is well to mention that sclerosed portions of the gland, particularly in the position of the pyramids, and tuberculous nodules, may at first sight be mistaken for stone; so if a nodule of doubtful character be felt, a needle should be passed into it through the substance of the kidney to ascertain its true nature. I never employ the method sometimes advocated, of puncturing the kidney all over for the purpose of detecting a stone. This practice is useless for the discovery of a small calculus, and is not devoid of danger, severe hæmorrhage sometimes resulting.

If no calculus be detected by the manipulations indicated, the kidney is freed from its fatty capsule sufficiently to permit of its being withdrawn through the wound on to the loin, where it is again examined by palpation. Should no stone still be detected, an incision 1 inch long is made by a scalpel a little below the centre of the convex border, and $\frac{1}{2}$ inch behind this and extending down to the renal pelvis. Through this the forefinger is introduced down to the pelvis, which with the calyces are in turn thoroughly explored by the finger-tip, counter-pressure being made on the outside of the gland by a finger of the other hand. In this way a methodical search is made all over the organ, so that even a small stone embedded in its substance may not be overlooked.

If the stone be found embedded in the substance of the kidney, it should be removed through an incision immediately

over it through the shortest route. But if it is lying in the pelvis or in one of the calyces, it should be removed through the incision in the convex border, already described, by means of forceps, or, better still, by coaxing it out by the tip of the forefinger of the right hand, the finger and thumb of the left hand grasping it outside the pelvis and pushing it out of the wound. A lithotomy scoop will sometimes be found more convenient than forceps for extracting the stone. This route is preferable to opening the pelvis and removing the stone in that way, as less liable to be followed by urinary fistula.

If the stone be large and branched, it may be necessary to break it up by means of forceps; but this should be avoided if possible, lest some of the débris be left behind unnoticed. The discovery of a stone or stones should not deter us from making a methodical search for others, for, as already stated, calculi are frequently multiple in the kidney.

When a small stone is detected in the pelvis or calyces, it should be grasped by the forefinger and thumb of one hand outside the kidney till its removal, for fear of its escaping into some remote recess in the gland.

Finally, a bougie should be passed through the wound down the ureter into the bladder, to ascertain that the ureter is free from stone.

The calculus, or calculi, having been removed, if the kidney be healthy—that is, if there be no suppuration, or only slight pyelitis—the wound in the gland is brought together by two or more catgut sutures deeply placed in its substance. The kidney is then returned into its original position. If, however, the stone was lying in a cavity full of pus, this should be thoroughly irrigated, and the wound left patent for drainage purposes, but no drainage-tube should be inserted in the kidney itself.

Sharp hæmorrhage sometimes follows an incision into the kidney. This is easily controlled for the time being by com-

pression of the pedicle between the finger and thumb; and on return of the organ into its bed and relaxation of the tissues in its pedicle it usually ceases. The sutures in the kidney will also arrest bleeding. It is very rare that hæmorrhage continues to such an extent as to necessitate plugging of the renal wound with gauze.

After the return of the kidney into its normal position the wound is thoroughly dried of blood by swabs, irrigation being avoided if possible; a stout drainage-tube is placed in the back of the wound reaching behind the kidney, and the wound in the loin is brought together, deep catgut sutures being used to bring the muscles together, and silk-worm gut for the superficial structures. Silk should on no account be employed for buried sutures in renal surgery, as this material is liable to get infected by urine and delay healing, having frequently to be removed after a lapse of weeks, or months even. The drainage-tube should be removed, cleansed, and shortened daily, and may be dispensed with after a week. Irrigation of the sinus should be avoided unless there be a profuse discharge of pus; but the sinus should be swabbed out daily by pledgets of dry cyanide gauze introduced by means of long slender forceps. The silk-worm sutures may be removed after seven or eight days.

If during the exploration of the kidney for stone it be discovered that the gland is completely disorganized, devoid of secreting tissue, and consisting merely of a sac of pus, the organ should be removed with the stone.

Nephrectomy (p. 377) will also be necessitated if the ureter be blocked in such a manner that its patency cannot be re-established, provided the other kidney be sound.

The operation of nephro-lithotomy is occasionally, though rarely, followed by permanent lumbar urinary fistula. For this distressful condition a secondary nephrectomy may become necessary, provided the other kidney is healthy.

I have performed the operation of nephro-lithotomy in sixty-six instances, thirty-nine being in males and twenty-seven in females. The ages varied from five and a half to seventy-three years. In five instances the operation was for recurrent stone in the same kidney, three of the original operations having been performed by myself, and two by other surgeons. In one case calculi were removed from both kidneys at different periods.

There were three deaths amongst these sixty-six operations, or a mortality of a little over $4\frac{1}{2}$ per cent. It is right to mention that I employ the term 'nephro-lithotomy' in its widest sense—that is, to denote the removal of a stone from the kidney no matter what the condition of that organ may be, whether practically sound or much disorganized from suppuration due to the presence of the stone.

Mr. Henry Morris, who was the great pioneer of surgery of stone in the kidney, limits the term 'nephro-lithotomy' to 'cases of removal of stone from the practically normal kidney' ('Surgery of the Kidney,' vol. ii., p. 124), the removal of a stone from a kidney more or less disorganized by purulent collections being regarded by him as 'nephrotomy for stone.' If this classification were adopted in my cases the mortality from nephro-lithotomy would be *nil*, the three deaths having occurred in connexion with suppurating kidneys, and therefore falling under the head 'nephrotomy.'

The objection to this terminology is that it is impossible under it to compare the results of different operators, surgeons differing so much in their interpretation of what constitutes a 'practically normal kidney.' The effect of this classification is to bring out in bold relief the trifling mortality from nephro-lithotomy in its limited sense as compared with that from nephrotomy for stone—an argument, as Mr. Morris forcibly puts it, in favour of early operation for renal calculus before suppuration sets in.

LECTURE XXI

IMPACTED CALCULUS OF THE URETER, AND SOME OTHER CAUSES OF OBSTRUCTION

OPERATIONS on the ureter, even in these days of active surgical interference, are of comparatively rare occurrence. By a singular coincidence, three cases illustrating various phases of ureteral surgery were recently operated on by me on the same day at St. Peter's Hospital. One of the patients is present here to-day, and I propose taking advantage of the occasion to review briefly the present position of surgery of the ureter for obstruction of that canal, particularly with reference to stone impacted therein, illustrating its various aspects by examples from my own practice.

The symptoms of renal and vesical calculus are generally well defined and characteristic. Those of stone in the ureter are, as a rule, extremely obscure. Indeed, it is only when the stone is impacted in the lower end of the ureter that a definite diagnosis can be ventured on.

A stone travelling down from the kidney to the bladder may be arrested in any part of the ureter where it meets with a contraction, curve, or valvular process of mucous membrane; but the situations in which it is most likely to get impacted are—(1) at a point 2 inches from the commencement of the ureter; (2) at the brim of the pelvis; and (3) at the vesical end of the canal.

When we speak of renal calculus, we include not only one

imbedded in the substance of the kidney, but also one lying in the pelvis or calyces of that organ. And this being so, I know of no symptoms by which we can, with anything approaching certainty, distinguish between a kidney stone lying in the pelvis and one impacted in the ureter at any position above an inch or two from its vesical orifice. The symptoms of a stone lying in any position along the greater part of the course of the ureter are, to all intents and purposes, the same as those of a stone lying in the renal pelvis and obstructing the ureter.

It is true that a ureteral calculus blocking the passage will give rise to hydronephrosis on the affected side, but so may a pelvic stone; and if both ureters be blocked in this way, calculous anuria will result. The X rays may assist us in forming a diagnosis, but this adjunct is even less satisfactory than in the case of renal calculus. It is also possible that a stone impacted in the ureter may give rise to pain or tenderness at the seat of impaction when deep pressure is made along its course, and this, combined with other symptoms, may lead us to suspect the nature of the disease. But the probabilities are so strongly against a definite diagnosis that the recognized rule of surgery in all such cases is to explore the kidney for stone in the first instance by the lumbar method, and if it be not found there, to examine the ureter by a bougie or probe passed down through the pelvis; and if a stone be thus found, to extend the lumbar incision parallel with Poupart's ligament sufficiently far to enable us to reach the stone and to extract it.

When, however, the stone is impacted in the lower end of the ureter at or near its vesical orifice, it generally admits of recognition, as we shall presently see.

I need scarcely tell you that when, after repeated attacks of renal colic, all the kidney symptoms cease and are replaced by those of stone in the bladder, you will come to the con-

clusion that the stone has made its way down the ureter, and that it is lying in the bladder. I could give you details of numerous cases from my own practice with a history of this kind in which I detected the stone in the bladder and removed it by litholapaxy.

But when the usual symptoms cease, and are followed by vesical symptoms, and no stone can be detected by the sound, you should suspect its impaction in the vesical end of the ureter, for a stone lodged in this position may give rise to all the symptoms of vesical calculus.

How are we to diagnose a stone situated in this position? Introduce, in the first instance, the forefinger into the rectum, the patient lying on his back, and with the other hand make deep pressure above the pubes, when you may feel the stone as a hard nodule lying in the ureter beyond the trigone of the bladder. In the female it may be similarly detected by introducing the finger into the vagina.

Then, again, if the stone project from the ureteral orifice into the bladder it may possibly be felt by the sound; or in the female the urethra may be dilated, a finger introduced into the bladder, and the calculus detected in this manner.

But in the electric cystoscope we possess the most important and reliable means of diagnosing a calculus lying in the lower end of the ureter or projecting from its orifice. By this instrument I have in recent years detected several calculi lying in this position which were not recognizable in any other way.

The cases which I shall now detail to you will illustrate the difficulties or facilities attaching to the diagnosis of stone impacted in the ureter, as well as the methods of dealing with it surgically, according to the position which it occupies along the course of that canal.

CASE 1.—*Calculus impacted in the Left Ureter 2 Inches below the Pelvis of the Kidney: Successful Uretero-Lithotomy.*—The patient, a male, aged

twenty-eight years, was admitted to St. Peter's Hospital on September 9, 1902, with symptoms of calculus in the left kidney of fourteen months' duration. There had been several attacks of left renal colic, each lasting about a week, and accompanied usually by hæmaturia. The pain commenced in the loin, and at times extended into the corresponding groin, and also into the testicle. The pain was absent at one period for two months, but had lately recurred with increased severity.

Left renal calculus being diagnosed, I explored the kidney on September 17 by the usual oblique incision in the left loin. No stone being found in the kidney, even after withdrawing it on to the loin and introducing the finger through an incision in its convex border into the pelvis, the lumbar incision was extended downwards an inch or two and the ureter traced downwards, when a stone was felt impacted therein 2 inches from the pelvis of the kidney. It was found impossible to push the stone up into the pelvis, so a longitudinal incision was made in the ureter over the stone, which was thus extracted. No sutures were introduced into the ureter, but a drainage-tube was inserted as far as the ureteral wound. Urine drained by the wound for four days and then ceased. The wound was thoroughly healed by October 16, when the patient went home, and has had no trouble since. The calculus was a rough oxalate one of the size of a date-stone.

CASE 2.—*Calculus impacted in the Right Ureter 4 Inches below the Pelvis of the Kidney: Uretero-Lithotomy; Cure.*—An artillery officer, aged twenty-three years, consulted me on July 19, 1898, on the advice of Dr. Charles Blood, then of Woolwich. He had had renal colic with hæmaturia off and on for nineteen months. A week previously the pain in the right loin, accompanied by vomiting and constant desire to micturate, was so prolonged and excruciating that he had to be kept under the influence of morphia for seventy-two hours. I found the right kidney greatly enlarged and tender, also acute pain on pressure on a spot midway between the umbilicus and the anterior superior spine of the ileum. The urine contained blood, albumin, and crystals of oxalate of lime. The case was diagnosed as one of stone in the pelvis of the kidney causing obstruction.

On July 30, Dr. M. A. MacDonnell, M.P., and Dr. H. T. Griffiths being present, I explored the right kidney by an oblique lumbar incision. The kidney was much enlarged, congested, and soft. It was withdrawn on to the loin and incised through the convex border, when a rush of urine took place through the wound. A finger was introduced through the wound, and the pelvis and calyces, which formed a large, irregular, smooth-walled cavity, were explored, but no stone was found. A bougie passed down the ureter was arrested 4 inches from the renal pelvis. Replacing the bougie by a long silver probe, a stone was felt at this

point. The incision in the loin was then prolonged downwards for 4 inches, and the ureter traced down till I felt the stone impacted therein, of the size of a filbert. I attempted to push the stone up into the pelvis, but without success. A longitudinal incision was made in the ureter over the calculus, which was thus removed. A bougie was then passed readily through the ureter into the bladder. No sutures were inserted in the ureter, but a drainage-tube was placed in the lumbar wound as far as the ureteral wound. Urine flowed through the loin for nine days and then ceased. The patient made a rapid recovery, and left the Surgical Home on September 7, and has since enjoyed good health.

It may be of interest, as bearing on the hereditary tendency of stone, to mention that on September 28, 1898, I removed successfully thirteen calculi from the kidney of this patient's mother, who had suffered for seventeen years, and that her father had suffered from gravel for several years before his death.

CASE 3.—*Calculus impacted in the Ureter 1 Inch above the Vesical Orifice: Vaginal Uretero-Lithotomy; Successful Result.*—A married woman, aged forty-two years, was seen in consultation with Dr. A. Crombie on July 30, 1902. She was suffering from left renal colic for a fortnight, with pains shooting down the groin; also hæmaturia. There were intense pain and tenderness in the groin. There was a small hard lump of the size of a pea felt high up in the vagina on the left side near the cervix uteri. The case was complicated by fever, the nature of which it was difficult to ascertain, as the patient had resided many years in India, thus arousing suspicions of malaria. Next day I examined her cystoscopically under an anæsthetic. The left ureteral opening was pouting, but no stone was seen; the bladder was healthy. I dilated the urethra and introduced my finger. Between this and a finger in the vagina the stone could be felt in the ureter about an inch from the bladder. I endeavoured to push it down into the bladder, but unsuccessfully.

The patient was placed on a course of Contrexéville water and salines, but no improvement taking place, I performed uretero-vaginal lithotomy on August 15. A sharp hook was passed through the vaginal wall above the calculus for the purpose of fixing the latter, which was then cut down on till grating was felt. In attempting to remove the stone by the finger and forceps it slipped up the ureter, but was found next day in the dressings. It was an oxalate-of-lime stone, of the size of a large pea. There was a smaller stone also found, of the size of a grain of No. 2 shot. Urine passed through the fistula for a few days and then ceased. Symptoms of pelvic cellulitis supervened, and the patient made a very slow recovery; she is now well, though there are suspicions that she is still suffering from a stone in the left kidney.

CASE 4.—*Calculus impacted in the Lower End of the Ureter: Retro-peritoneal Uretero-Lithotomy; Cure.*—A female, aged eighteen years, came to St. Peter's Hospital on July 25, 1902, with a history of left renal colic of eighteen months' duration. The pain frequently recurred, sometimes daily, and shot downwards from the loin to the groin. It was very severe, 'doubling her up,' and attended by nausea, vomiting, and profuse perspiration. Hæmaturia was observed on several occasions. There was no enlargement of the kidney and no tenderness on pressure. Getting no better under treatment as an out-patient, she was admitted, and on September 12 was examined under an anæsthetic. Cystoscopy revealed nothing abnormal about the ureteral openings. A small hard nodule of the size of a split pea was felt high up in the vagina on the left, to the outer side of the cervix uteri, and this was diagnosed to be a stone in the lower part of the ureter.

On the 19th I operated, commencing by an incision 4 inches long, as for ligature of the left external iliac artery. The dissection was then carried through the abdominal wall down to the subperitoneal tissue. The peritoneum was raised inwards off the upper pelvic walls, exposing the iliac vessels, when the ureter was recognized adherent to the peritoneum and crossing the artery, and was traced down into the true pelvis behind the walls of Douglas's pouch. A small stone being felt in the ureter 1 inch from the bladder, a longitudinal incision was made in the dilated ureter a short distance above this, it being found impossible to reach the stone with the knife, owing to its depth in the pelvis. The incision was immediately followed by a rush of urine. The calculus was grasped by sinus forceps introduced through the ureteral incision, and, breaking into fragments, was removed piecemeal. The calculus consisted of uric acid, and weighed only 5 grains. The ureteral wound was closed by fine interrupted silk sutures, a gauze drain introduced, and the abdominal wound closed by silkworm sutures. In spite of the sutures in the ureter the wound leaked, some urine passing in this way for a few days. The case did well, however, and the patient was discharged cured on October 18.

CASE 5.—*Diverticulum of the Ureter forming a Cystic Tumour in the Bladder containing two Calculi: Removal by Suprapubic Cystotomy; Cure.*—An officer, aged thirty-six years, consulted me on September 21, 1896, on his return from Burma, on the advice of Major A. O. Evans, I.M.S. He dated his illness to a fall on his back ten years previously. For two years after this he suffered periodically from pain in his right loin, hæmaturia, and frequency of micturition. The kidney symptoms then practically ceased, and were replaced by bladder symptoms which had progressively increased—viz., frequency of micturition and pain accompanying the act, intermittency of the flow, inability to empty the bladder

except by lying down or passing a catheter, and pus in the urine periodically in large quantities. There had been no blood since 1890. He had been sounded by several surgeons besides myself with negative results. On cystoscopic examination I discovered a tumour of the size of a walnut growing from the right posterior aspect of the bladder, with a smooth glistening surface and attached by a broad, short pedicle.

I opened the bladder suprapubically on September 29, and felt a slightly dilated cystic tumour attached to the right side of the base of the bladder by a round, tense pedicle as thick as my thumb. The tumour was grasped by forceps and brought up into the wound, when it was felt to be quite hard. On scraping it by the finger-nail, to my astonishment it was found to contain two oval, smooth calculi, one of the size of a nutmeg (29 grains) and one of the size of a pea (12 grains), which were removed. The cyst, which was now flaccid like the finger of a glove, was excised close to the bladder wall. The patient made an excellent recovery, and left the Surgical Home on November 10 untroubled by any urinary symptoms, and has remained well ever since.

The tumour was found to be a thin-walled cyst covered on both surfaces by transitional epithelium, such as is found in the bladder and ureters. It did not contain any ureteral orifice. It is evident that the calculi from the kidney passed down till they got impacted in that portion of the ureter which passes obliquely through the bladder wall, and, impelled onwards by the accumulation of urine behind, bulged the ureteral wall into the bladder, thus forming a pendulous cystic tumour which acted as a ball-valve and prevented the free flow of urine from that viscus.

CASE 6.—*Calculus impacted in the Left Ureter at the Vesical Orifice: Removal by Suprapubic Cystotomy; Cure.*—A gentleman, aged forty-three years, consulted me May 17, 1900, on his return from India. A year previously he suffered from severe left renal colic, with hæmaturia and constant desire to pass urine. He was seen by two well-known surgeons in Bombay, who diagnosed renal calculus. In August, 1899, the renal symptoms had disappeared, and since then there had been almost constant pain in the perineum and along the penis, particularly marked behind the glans after micturition. There was great frequency of micturition, half-hourly by day and three or four times at night. The urine was acid and contained much pus and urate crystals. The patient was sounded, but no stone was discovered. The introduction and manipulation of the sound caused much pain at the neck of the bladder. Cystoscopic examination on May 23 revealed a normal right ureteral opening, but in the position of the left opening a smooth tumour of the size of the nipple of a woman's breast, with a dimple in its centre, at the bottom of which was seen a small brown speck. This was diagnosed to be a prolapse of the ureter which contained a stone.

On May 26 I opened the bladder suprapubically, and on introducing my finger felt the prolapsed ureter with stone enclosed therein as diagnosed by the cystoscope. By the aid of the finger of an assistant in the rectum the ureter was raised close to the wound, when it was transfixed by a sharp hook and incised over the stone, which was thus set free in the bladder and extracted by forceps. The patient made an uninterrupted recovery, and on June 28 left the Surgical Home quite well and free from urinary symptoms. He has since married and has remained free from urinary troubles.

CASE 7.—*Calculus impacted in the Lower End of the Right Ureter and projecting into the Bladder: diagnosed by the Cystoscope; removed by Lithotrite.*—A man, aged fifty-three years, had attended off and on as a patient at St. Peter's Hospital for thirteen years for stricture of the urethra and symptoms of stone in the left kidney, which had been explored with negative results. For several months in 1898 he suffered from symptoms of stone in the right kidney—viz., pain, hæmaturia, and periodical swelling in the corresponding loin, the subsidence of which was followed by a profuse discharge of pus in the urine. In October he began to complain of symptoms of stone in the bladder—viz., constant desire to micturate with pain at the end of the penis. Cystoscopic examination on November 9 revealed a narrow, rough, pencil-shaped stone projecting into the bladder from the right ureteral opening, which appeared to be three-quarters of an inch in length. My colleague, Mr. Reginald Harrison, and others had an excellent view of the stone. I at once introduced a lithotrite, and after three or four unsuccessful attempts eventually caught the stone between the blades, pulled it out of the ureteral orifice, crushed it, and removed the débris (which consisted of urates and weighed 12 grains) by the aspirator. On recovery I again made a cystoscopic examination, when both ureteral openings were seen to be patent. This is, as far as I can ascertain, the first occasion on which this method of removing a stone projecting from the ureter into the bladder has been employed.

I will briefly refer to three other instances of stone impacted in the ureter which have been operated on by me, all of them during my Indian experience. [Since this lecture was delivered in 1903 I have removed several ureteral calculi by the methods above described.] In these cases the stone was impacted at the ureteral orifice and projected into the bladder, and was felt by the sound. One of them occurred in a female and two in males. In each instance an operation was under-

taken under the impression that I had to deal with an ordinary case of stone in the bladder. The stone was dislodged from its position by introducing the finger through the ordinary perineal lithotomy wound in the males and through the dilated urethra in the female, the orifice of the ureter was scraped with the finger-nail, and the stone, being forced downwards by a hand placed on the groin, was then removed by lithotomy forceps.

I have no personal experience of intraperitoneal removal of ureteral calculus. Mr. Arbuthnot Lane has placed on record a successful case, but other cases are recorded in which the operation was followed by disastrous results. Considering the grave danger of urine leaking through the ureteral wound into the peritoneum, no matter how carefully the edges of the incision in the ureter are brought together by sutures, I hold that, even when the abdomen is opened for the purpose of effecting a diagnosis, if a stone be located in the ureter, the abdomen should be closed and the calculus removed at a subsequent date extraperitoneally. I was pleasantly surprised at the comparative ease with which in Case 4 the stone impacted in the ureter close to the bladder was reached and removed extraperitoneally by the groin incision. Mr. Betham Robinson, who was, I believe, the first to perform this operation, has placed two successful cases on record. I should in any future case of the kind adopt this route rather than the vaginal, which, apart from other drawbacks, is liable to be followed by a permanent urinary fistula.

It is neither necessary nor advisable to close the ureteral wound by sutures when the stone is removed by an extraperitoneal operation.

It will have been observed from the details of the foregoing cases that a definite diagnosis of stone in the ureter was arrived at only in those instances in which the calculus

was lodged at or near the vesical end of the canal. Indeed, in the first two cases, in which the calculi were impacted in the upper half of the ureter, the exploratory operations were undertaken under the impression that the calculi were situated in the kidney itself or its pelvis.

But the difficulty of diagnosing stone in the ureter is still further enhanced by the fact that there are other conditions which give rise to obstruction of the canal, the symptoms of which approach very closely to, if they do not actually simulate, those of calculus. The most common of these conditions are: stricture, stenosis, or kinking of the ureter; valvular obstruction, caused by a spur of mucous membrane, or by an oblique junction of the ureter with renal pelvis; compression of the ureter from without by fibrous bands, or by an abnormal branch of one of the renal vessels; a twist of the ureter on its axis, as a rule caused by movable kidney—all of which conditions, though they may possibly be suspected to exist, cannot be definitely diagnosed without having recourse to surgical operation. An example is afforded in one of the three cases alluded to at the beginning of this lecture, the details of which are as follows:

CASE 8.—*Hydronephrosis; Movable Kidney; Kinking and Stricture of the Ureter: Dilatation of the Stricture and Nephrorrhaphy; Cure.*—A woman, aged thirty-one years, had suffered for eighteen months from pain in the left lumbar region. The attacks were marked by fearful agony, accompanied by vomiting, cold sweats, severe hæmaturia, and great frequency of micturition. The left kidney was very movable, and a fullness was felt in the left loin. Cystoscopic examination on September 14, 1902, showed the left ureteral opening to be enlarged and irregular.

On the 19th I explored the left kidney by the usual oblique lumbar incision. The kidney was easily withdrawn on to the loin; it was hydronephrotic, the pelvis being enormously distended, and fully half the size of a normal kidney. An incision through the convex border of the kidney, and the introduction of the finger into the pelvis, was followed by the escape of a large quantity of urine. No stone was present. I then attempted to pass a catheter through the ureter, but it was arrested just below the pelvis of the kidney. Exploration by the finger external to the

ureter discovered a kink in the ureter at this point, and also a stricture due to inflammatory adhesions of the peri-ureteral connective tissues. The latter were stripped off the ureter at the strictured point, and then a succession of bougies were passed through the stricture. Nephrorrhaphy was then performed, the kidney being fixed high up so as to put the ureter on the stretch. The wound was healed, and the patient was discharged on October 18. On January 12, 1903, the patient was in excellent health, untroubled by any urinary symptoms.

If the stricture or stenosis, whether congenital or acquired, be inherent in the ureter itself, and not caused by some constriction from without, mere dilatation will not as a rule suffice for a permanent cure. A fine bougie should be passed through the stricture, either by way of an incision in the convex border of the kidney extending into the renal pelvis, or of an opening made directly in the pelvis itself. A longitudinal incision is then made through the wall of the ureter over the stricture, and extending slightly beyond it on either side. A fine silk suture is now passed through the ureteral wall at the extreme ends of this incision, which when brought together convert the longitudinal into a transverse chink. The edges of this chink are carefully united by sutures, passed through the fibrous and muscular coats only, after the method of Lembert, avoiding the mucous lining of the canal. In this way the stricture is obliterated. The bougie is then withdrawn.

A kink or twist of the ureter should be relieved, and nephrorrhaphy performed, the kidney being fixed high up so as to put the ureter on the stretch. A valvular formation of the mucous membrane obstructing the flow of urine is generally found at the junction of the ureter and renal pelvis, and is, as a rule, associated with movable kidney. It should be incised longitudinally by a narrow-bladed knife, or nicked by scissors introduced through an incision in the pelvis. In some cases a plastic operation is required for the cure of this malformation.

LECTURE XXII

RENAL TUMOURS

TUMOURS of the kidney may be either *primary* or *secondary*. The former alone are of surgical importance, as the latter do not admit of surgical interference.

The pathology of renal growths is at present in a most unsatisfactory position. Their origin is still veiled in obscurity, though the researches of Grawitz and others tend to show that certain forms of an adenomatous type spring from renal inclusions, or 'rests,' as they are termed,—that is, adrenal tissue that has in the course of development strayed into, and got included in, the kidney tissue,—and have a tendency to assume a malignant character. Pathologists also differ widely in their interpretation of the nature of certain forms of growth. Again, some varieties which have apparently a carcinomatous or sarcomatous structure are unattended by those clinical features usually associated with malignant tumours, whilst growths apparently benign in structure are accompanied by all the symptoms of malignancy.

Under these circumstances no scientific classification of renal tumours is possible—that is, one where pathological grouping will be in accordance with their clinical history.

For descriptive purposes renal tumours may be divided into *simple* and *malignant*, and the former subdivided into *cystic* and *solid*.

Simple or benign growths form but a small proportion of the whole. They rarely give rise to symptoms, being, as a rule, encountered unexpectedly during post-mortem examination, so that they are of minor surgical importance.

We will, therefore, first direct attention to the

Malignant Growths.

1. **Sarcoma.**—This is the most common of the new growths of the kidney. Its age-distribution is peculiar, occurring most frequently during the first five years of life, and next between the ages of thirty and fifty, the intervening period enjoying a comparative immunity from the disease.

The tumours found in these respective periods possess some distinctive peculiarities, not only as to structure, but also as to the region whence they originate.

In childhood the growth springs from the connective tissue of the renal sinus, and gradually encroaches on and expands the medulla and cortex, till eventually it is encircled by the fibrous capsule with a thin compressed layer of renal tissue. Bland-Sutton and many other pathologists now hold that the origin of these infantile sarcomatous growths is in reality extrinsic and non-renal, and that the kidney tissue is gradually destroyed by invasion from without.

The sarcomata of infancy are rapid-growing, attain to enormous dimensions, are frequently bilateral, and invariably fatal. They are rarely attended by pain, hæmaturia, or other urinary symptom. Microscopically they show a connective-tissue base containing round, oat-, or spindle-shaped cells. The spindle cells frequently show a cross striation resembling that of voluntary muscle fibres: the tumour is then termed myo-sarcoma.

In adult life the sarcomata arise in the cortex in connexion with the fibrous capsule, and invade the renal tissue from

without inwards. They are of the spindle-celled variety. The disease is, as a rule, unilateral.



FIG. 138.—SARCOMA INVOLVING UPPER TWO-THIRDS OF KIDNEY.

The growth extended to the renal pelvis, perforated the capsule at upper end of the kidney, and extended to the adrenal, which is attached. Successfully removed by author, March 7, 1900. Survived four years.

Grawitz has found that in many of the sarcomata of adults the structure of the zona fasciculata of the adrenal is reproduced, and he holds that these growths spring from accessory

adrenals, or 'rests,' which have long been known to occasionally exist beneath the capsule of the kidney.

2. **Carcinoma.**—We possess but a very limited knowledge of cancer of the kidney, owing to the fact that it is only within



FIG. 139.—CARCINOMA OCCUPYING LOWER THIRD OF KIDNEY, EXTENDING TO PELVIS AND PLUGGING RENAL VEINS.

Capsule not perforated by growth. Successfully removed by author, February 28, 1900. Survived seven and a half years.

the last few years that this disease has been distinguished from sarcoma.

Cancer of the kidney is confined to adults, and rarely occurs before middle life, after which there is an increasing liability to its occurrence with advancing age. It is almost invariably unilateral.

This disease has its origin in the epithelium of the uriniferous tubules, and gradually invades the renal tissues without destroying the general conformation of the organ. It eventually invades the pelvis of the kidney and extends to the ureter. The usual types of carcinoma, viz., encephaloid, scirrhus, colloid, and epithelioma, are represented. Microscopically it is frequently impossible to distinguish between adenoma and carcinoma.

Symptoms.—The main symptoms of renal malignant growths are hæmaturia, pain, cachexia, and the presence of a tumour.

The existence of a tumour in the loin is the earliest and most common indication of renal malignant growth, and may for long remain the only one. As it enlarges it advances forwards, and may eventually fill the abdominal cavity. The fingers cannot be inserted behind it, and there is no resonance in this position, continuous dulness extending forwards from the spinal muscles, and from the ribs to the iliac crest. The tumour retains, as a rule, its reniform outline, and is smooth, though it may be nodulated and irregular. The colon is felt tympanitic in front of or along the inner border of the tumour. In the early stages the tumour may be slightly mobile on palpation, or even during respiration; later on it is invariably fixed.

Hæmaturia occurs in about 50 per cent. of the cases. Occasionally, though rarely, it is the first symptom noticed. It varies from a mere microscopic quantity in the urine to profuse hæmorrhage endangering life. The urine is, as a rule, uniformly mixed with blood, but vermicular clots may be present, being thus moulded in passing through the ureter. The bleeding comes on spontaneously, and is uninfluenced by position or movements, thus presenting a marked contrast with that dependent on calculus.

Pain is by no means a prominent symptom. It does not

occur, as a rule, till adhesions are contracted with the surrounding structures, or the tumour attains such a size that it causes pressure on the adjacent organs. It is usually absent in children. The pain is of a dull aching character, as a rule amounting merely to discomfort, in the loin; but acute renal colic may be caused by the passage of clots or detached portions of growth through the ureter. When the tumour is very large, causing pressure on the nerves, the pain may shoot down the corresponding hip, thigh, and leg.

Cachexia, with loss of appetite, flesh, and strength, are invariably present in adults, but are absent in the early stages of the disease in children.

Guyon was the first to point out that malignant growths of the kidney are occasionally accompanied by varicocele on the corresponding side, due to pressure on the spermatic vein by enlarged glands. The sudden occurrence of this condition in elderly men should, therefore, direct attention to the condition of the corresponding kidney.

Uræmia does not occur unless the second kidney is affected.

Beyond the presence of blood there is nothing characteristic of this disease in the urine, unless portions of growth be detached and passed.

In diagnosis we have to differentiate malignant growths from other diseased conditions of the kidney, viz., renal calculus, movable kidney, renal tuberculosis, hydro- and pyonephrosis, and the simple tumours of the organ, to be presently described. The extra-renal conditions with which the disease may be confounded are: perirenal growths, adrenal tumours, peritoneal growths, omental and mesenteric tumours, tumours of the liver, enlarged gall-bladder, splenic enlargements, tumour of the abdominal walls, faecal accumulations, and ovarian and uterine tumours.

The presence of blood in the urine will exclude all extra-

renal conditions ; and the cystoscope will enable us to ascertain from which ureter the blood issues, thus definitely indicating the kidney affected.

The *diagnosis* of renal malignant growths is sometimes extremely difficult ; and as their early detection, with a view to removal, is of vital importance, an exploratory operation in doubtful cases is imperatively indicated.

The *treatment* consists in the complete removal of the affected kidney as early as possible. Provided the tumour be of such moderate dimensions that it can be removed through a lumbar incision, the nephrectomy should be performed by this method (p. 377) as it is attended by a much smaller mortality than the transperitoneal operation.

Tumours having their origin in adrenal 'rests' have a much less tendency to recur after nephrectomy than other forms of malignant growths of the kidney.

Cystic Tumours.

The following varieties of cystic tumour are found :

1. Numerous minute cysts, said to have their origin in dilated tubules, occur in connexion with chronic granular nephritis, embedded in the substance of the kidney, and frequently projecting on its surface. They give rise to no special symptoms apart from the disease in connexion with which they are found, and are of no clinical importance.

2. Simple serous cysts, varying in size from that of a walnut to very large dimensions, occur in an otherwise normal kidney. They may be single or multiple. They arise from the cortex, but bulge from the surface of the gland, and contain a thin clear or brownish fluid with albumen and salines in solution. Most frequently they occur at one or other of the poles of the kidney, and are usually unilateral. The cyst wall is thin and transparent, and continuous with the renal tissue.

They are attended by no symptoms except those arising from their size when large.

The treatment consists in evacuation of the contents, excision of the prominent portion of the sac, scraping the affected portion of the kidney with a sharp spoon, and drainage.

3. The term 'cystic (or polycystic) disease' is applied to a very characteristic condition in which the whole kidney, though retaining its general outline, is converted into a congeries of cysts, so that it resembles a large bunch of grapes. Two forms are recognized—the congenital and the acquired, or, rather, that in which the disease is only recognized in adult life. Both kidneys are usually affected, though the disease may be more marked in one than in the other. The cysts vary in size from almost microscopic dimensions to a medium-sized grape; they are isolated from each other, and their contents cannot be emptied by pressure. All distinction between cortex and medulla of the organs is lost, the whole kidney being a mass of cysts, but with considerable quantities of renal tissue intervening. The kidneys are always much increased in size, and in the congenital varieties they sometimes attain such a magnitude as to seriously interfere with labour.

This disease is difficult to diagnose in its early stages, there being no definite symptoms to rely on. It runs a slow and latent course, being only detected, as a rule, towards the end when uræmic symptoms set in; but before this there may be emaciation and loss of strength, with dull, heavy pain in the loins. Eventually large bilateral bossy tumours, retaining the general renal outline, will be detected in the loins. The urine is generally abundant, pale, and contains a trace of albumen. Uræmia is invariably the cause of death.

Surgical intervention is of no avail in this disease, as it is invariably bilateral.

4. Hydatid cysts are occasionally found in the kidney. The disease commences either beneath the capsule or in the areolar tissue of the renal pelvis. As the cyst increases in size it causes atrophy of the renal tissue, and may eventually lead to its complete destruction. It may, however, burst into the renal pelvis, the 'daughter' cysts being discharged in this way, and thus a cure ensuing.

The diagnosis is obscure, unless the sac bursts and its contents appear in the urine. The disease is usually only detected during an exploratory operation undertaken for obscure renal tumour.

The treatment consists in incision of the sac, removal of its contents, and free drainage, with daily irrigation of the cavity. Nephrectomy may be advisable if the kidney substance is seriously invaded.

Solid Benign Growths.

Solid benign growths are extremely rare. They scarcely ever give rise to symptoms rendering them capable of detection during life, and are practically only discovered during post-mortem examination. Consequently, they have no clinical significance, and will be only briefly referred to.

1. **Adenomata** are usually found as small encapsuled tumours embedded in the substance of the kidney, or projecting from its surface. They may be single or multiple, and have a tubular or cystic structure.

Many of the adenomata are supposed to spring from adrenal rests, and are malignant, as already stated. It is extremely difficult to draw a line of distinction between the simple and malignant forms, as they shade off into each other.

2. **Fibromata** are encountered in the form of small, hard, rounded nodules in the renal substance, or beneath the fibrous capsule. They are generally found in connexion

with diffuse interstitial nephritis, and have a tendency to undergo degenerative changes and lead to cystic formation.

3. **Lipoma** is extremely rare. It is generally found beneath the capsule, pushing the cortex away from it, or beneath the mucous membrane of the renal pelvis, and, as it increases in size, may fill the pelvis and upper part of the ureter.

4. **Myxoma, enchondroma, angioma, and lymphangioma**, are pathological curiosities.

Papilloma of the renal pelvis and calyces is very rare—much more rare than in the bladder, simultaneously with which it sometimes occurs. It presents the same characters as papilloma of the bladder, already described (p. 213). As it has a marked tendency, even when apparently benign, to degenerate into malignancy, the treatment consists in complete removal of the kidney with the growth.

Nephrectomy.

The conditions for which **nephrectomy**, or removal of the kidney, may be required are: (1) renal tumours; (2) papilloma of the renal pelvis; (3) tuberculous kidney; (4) total disorganization of the kidney resulting from calculus; (5) rupture of the kidney from injury; (6) hydronephrosis; (7) pyonephrosis; (8) floating kidney; (9) intractable renal fistula; and (10) injury to the ureter.

Ureterectomy, or excision of the ureter, may in addition be required for—(1) ureteral tuberculosis; (2) ureteral tumour; and (3) dilatation of the ureter resulting from impacted calculus or other source of obstruction.

There are two routes through which the kidney may be approached—the lumbar, or extra-peritoneal, and the abdominal, or transperitoneal. The mortality attending the latter method of performing nephrectomy, or, indeed, any operation on the kidney by the transperitoneal route, is so extremely high in comparison with the former, owing chiefly to the

danger of infection of the peritoneum, that the lumbar method should be invariably employed, save, perhaps, in the case of very large renal tumours. Even in case of renal growths I consider that any tumour that is capable of being removed at all with safety is removable through the loin.

Lumbar Nephrectomy.—The kidney is exposed through an oblique incision in the loin as in the operation of nephrolithotomy (p. 349), and the fatty capsule completely separated from it by the finger-tips. The pedicle is then cleared of its surrounding tissues, and the kidney brought out on the loin if possible. No tension, however, should be placed on the pedicle, for fear of tearing the vessels, particularly the vein. The ureter is then separated from the rest of the pedicle by blunt dissection, and caught by catch forceps, by which it is held aside to be subsequently dealt with. A large aneurism needle armed with stout silk is then pushed through the centre of the pedicle, between the vessels, from behind forwards, or in the reverse direction, as far back and away from the kidney as possible. The needle is now withdrawn leaving a double ligature through the pedicle, when the loop of silk is divided. Each ligature is then tied firmly round its corresponding section of the pedicle, and one of them finally round the whole pedicle. Whilst passing the aneurism needle the pedicle is put on the stretch, but it should be completely relaxed during the tying of the ligatures, by pushing the kidney back partly into the wound, thus enabling the vessels to be tightly compressed. The pedicle is divided by scissors about $\frac{1}{2}$ inch from the ligature, thus leaving the kidney attached by the ureter only. If the pedicle be short and the kidney can be only partly withdrawn into the wound, it will be advisable before passing the ligature through the pedicle to compress the latter temporarily by large curved catch forceps, which should be slowly opened after division of the pedicle, so that any bleeding vessels may be caught up

and ligatured separately. If the wound be thoroughly aseptic the ligatures on the pedicle may be cut short; otherwise they should be left long, hanging out of the posterior angle of the wound beside the drainage-tube, so that they can be pulled away eventually when the stump of pedicle separates. My own practice is now invariably to leave the ligatures hanging out, as when cut short they are liable to set up irritation and cause troublesome sinuses, lasting for months, or even years, till they eventually come away or are removed.

The ureter is now carefully examined. If quite healthy two ligatures are applied low down in the wound and the ureter divided between them, the kidney being thus severed from its connexions. If, however, it be thickened from tuberculosis, greatly dilated from obstruction, or otherwise diseased, the ureter should be at once removed.

Ureterectomy.

Ureterectomy is performed by extending the oblique lumbar incision downwards and inwards, as far as the middle of Poupart's ligament if necessary, and dividing the muscles along the whole length of the incision. Tracing the ureter downwards from the renal pelvis, it is gradually separated from the peritoneum and surrounding tissues by the thumb, index and middle fingers of one hand, along the course of the wound. In this way it can be traced as far as the brim of the pelvis, or even right down to its insertion in the bladder. A ligature is applied below the lowest point of the disease, and the ureter severed close above this.

Whether the kidney alone, or with it the ureter, be removed, the deep and superficial parts are brought together, and the wound treated generally as already described in the case of nephro-lithotomy.

In case of large tumours of the kidney more room may be obtained by subperiosteal excision of the last rib.

Should the adhesions between the kidney and the fatty capsule be so intimate from chronic inflammation that it is impossible to separate them, the kidney may have to be shelled out of its fibrous capsule, piecemeal or *en masse*. This is termed **subcapsular nephrectomy**. After removal of the kidney in this manner, its fibrous capsule can frequently be clipped or dissected away, and this should always be accomplished if possible.

Partial Nephrectomy.

In certain diseased conditions and injuries affecting portions only of the kidney, such as localized tuberculosis, simple cysts, hydatid cysts, renal fistula, benign solid growths, and lacerated portions of the organ, partial nephrectomy is sometimes had recourse to.

After the kidney is withdrawn on to the loin, the vessels of the pedicle are compressed between the forefinger and thumb of the surgeon, or by an assistant, and a wedge-shaped section of the organ including the diseased portion is cut away. Any large bleeding vessels are ligatured, and the cut surfaces brought firmly together by catgut sutures placed deeply in the substance of the kidney. The organ is then returned into its natural position.

The procedure is not very effectual in renal tuberculosis, total nephrectomy being subsequently necessary in a large proportion of these cases.

Having come to the conclusion that nephrectomy is necessary for the cure of the disease or the prolongation of the patient's life, the all-important questions will arise as to (1) the existence of a second kidney, and (2) its condition—whether it be sound, or sufficiently sound to carry on the functions of both organs after the removal of one.

It must be borne in mind that congenital absence of one kidney occurs once in about 4,000 individuals, and that fusion

of both kidneys ('horseshoe kidney') occurs still more frequently. To establish the absence of these conditions demands careful investigation.

In thin subjects the second kidney may be felt by palpation of the abdomen ; and the administration of an anæsthetic will frequently facilitate examination in this way.

It has been urged that the transperitoneal method has the advantage of enabling the surgeon at the time of operation to ascertain the condition of both kidneys ; but, if so desired, the peritoneum may be opened through the lumbar incision, and the hand passed across the abdomen to ascertain the condition of the opposite kidney.

If the kidney about to be removed be completely destroyed, and useless so far as function is concerned, the second kidney will gradually have assumed the functions of both, and will probably be hypertrophied, thus rendering palpation of the organ more easy.

The cystoscope will enable us to ascertain if urine escapes from both or only one ureteral orifice, and, frequently, the condition of the urine so escaping.

Catheterism of the ureters (Lecture IV.) will still more definitely decide the composition of the urine secreted by each kidney, and consequently the condition of the organs themselves. Luys's separator (Lecture IV.) may also be employed for the same purpose.

In recent years attempts have been made to estimate the 'renal function' of each kidney by various methods, chief amongst these being what are known as 'cryoscopy,' the 'methylene blue test,' and the 'phloridzin glycosuria test.' An excellent account of these, with practical examples of their working, is given by Thomson Walker in the Hunterian Lectures for 1907. These methods require much time, care, and patience in their application ; they are liable to many fallacies, and can scarcely as

yet be regarded as within the sphere of practical aids to diagnosis.

The operation of nephrectomy is undoubtedly a grave one—one of the most serious in surgery; but it is only undertaken in conditions that render life unbearable, or which, if left to run their course, inevitably end in death at no distant date. The success of the operation will depend mainly on the condition of the remaining kidney—that is, as to its capacity to perform the functions of both.

I have undertaken this operation for various conditions in forty-three instances, all by the lumbar route, with five deaths, or a mortality of 11·6 per cent. Amongst these were seven nephrectomies for renal tumour (one cystic and six malignant), all in adults and all successfully.

LECTURE XXIII

MOVABLE KIDNEY

THE kidneys, lying in the lumbar recesses on either side of the spinal column, are maintained in position by—(1) the fat in which they are embedded; (2) the fascia which forms the framework of this fat, strong bands of which pass from the posterior walls of the abdomen to the fibrous capsules of the glands; (3) the structures forming the pedicles of the organs; (4) the general supporting pressure of the abdominal viscera; and (5), to a slight degree, the peritoneum covering the ventral aspect of the glands.

The normal kidney is slightly movable in the vertical direction during respiration, the degree of mobility varying from $\frac{1}{2}$ inch to $1\frac{1}{2}$ inches, the right kidney being somewhat more mobile than the left. Any greater range of mobility of the organs is regarded as abnormal.

The term 'movable kidney' is employed to denote this abnormality when the movement is confined to the vertical direction, behind the peritoneum, and is of moderate range. When the mobility is of such a pronounced character as to permit of the organ wandering, or being pushed, all over its own side of the abdomen, or even in some cases to the opposite side, the term 'floating kidney' is used.

It is held by some writers that in exceptional cases of floating kidney the gland and its pedicle are completely covered by peritoneum, forming a distinct meso-nephron.

This condition, if it ever occurs, is extremely rare, and some of the most experienced surgeons hold that its existence is purely mythical.

The exact tissue changes that occur in connexion with movable kidney are obscure. The condition is much more common in females than in males, the proportion being about 7 to 1. It is more frequently encountered on the right side than on the left, and it is almost entirely confined to adult life between the ages of twenty-five and fifty, though it occurs rarely in children, and may even be congenital.

It is most commonly found in multiparæ in whom children have been borne in rapid succession, particularly in those who have to return to heavy physical work shortly after parturition. The violent expulsive efforts incident to parturition, and the sudden diminution of the intra-abdominal pressure, are both factors that favour loosening of the kidney. If in addition the patient assumes the erect position at an early date, and has to engage in physical labour, the attachments of the kidney have not time to contract, as they would do if the recumbent position were maintained for a lengthened period, and the organ becomes permanently mobile.

The condition not unfrequently follows on rapid emaciation from any cause, owing to the diminution of the supporting fat.

It is frequently found in connexion with general **enteroptosis**, a condition in which the abdominal contents generally, and particularly the stomach, intestines, and sometimes the liver, descend to an abnormal degree.

Mobility of the kidney may result from traumatism, dislocation of the organ being caused either by direct injury to the loin, or by the jar produced by jumping from a height.

It is doubtful if tight-lacing has any bearing on the production of this condition.

The disease is attended by the following symptoms: There is a dragging sensation with a feeling of weight in the corresponding loin and side of the abdomen. There is a dull, heavy, aching pain in the loin, occasionally passing into an attack of acute renal colic, accompanied by nausea, vomiting, and collapse. Sometimes attacks of jaundice occur, from dragging of the loose organ on the duodenum, giving rise to compression of the common bile-duct. Dyspepsia, flatulence, and constipation occur. Frequency of micturition, polyuria, and hæmaturia (from kinking of the renal vein), are sometimes, though rarely, present. All the symptoms are increased by movements, particularly jolting; they are completely absent during rest in the recumbent position.

In many cases there are no symptoms present, and a movable kidney is accidentally discovered when making an abdominal examination for some other malady.

It is somewhat remarkable that the symptoms are in no way proportionate to the mobility of the organ. A kidney may wander all over the abdomen and cause no inconvenience, whereas a slightly mobile gland may give rise to the most distressful symptoms.

The condition is frequently associated with the neurotic symptoms comprehensively classed under the term 'neurasthenia.' These symptoms are in some instances undoubtedly dependent on the abnormal condition under review; in others they are merely coincident therewith.

Hydronephrosis, due to kinking of the ureter, is an occasional symptom.

With the presence of some or all of these symptoms, we proceed to ascertain the condition of the kidneys on palpation, in the manner already indicated when dealing with the subject of renal calculus.

It must be remembered that the normal kidney is not

discoverable by palpation of the abdomen except in emaciated subjects.

The patient lying in the dorsal recumbent position, the fingers of one hand are placed on the loin and those of the other on the front of the abdomen below the ribs. The patient is directed to take a deep inspiration, when the hands are suddenly approximated towards each other. The movable kidney descending below the ribs during inspiration is gripped between the fingers, and on further pressure or relaxation of the hands, it slips up again during expiration.

The degree of mobility varies from a slight descent of the organ, enabling its lower end to be felt, but not held, between the hands, to such an extent that the kidney is encountered in the region of the navel, or even at the iliac fossa.

The extent of the mobility should also be ascertained when the patient lies on the sound side, as well as in the erect position.

As a rule, the movable kidney is felt to be of normal size. Sometimes it is smaller and harder than the normal, from degeneration of its texture. More frequently it has a tendency to become permanently enlarged from vascular engorgement due to obstruction of the renal vein.

An examination of both kidneys should be made. It will not unfrequently be found that the distressful symptoms are due to a slightly mobile kidney, whereas the other may be so loose as to wander all over the abdomen and give rise to no symptom whatever.

It should be borne in mind that a loose kidney may also be the seat of a calculus, malignant growth, or of tuberculosis. Hydronephrosis may also be present, as already stated.

The treatment of movable kidney is of two kinds—*palliative* and *operative*. Some ten or twelve years ago there was a tendency among surgeons to employ operative interference

in almost all cases of this malady. Then a reaction set in against this method, owing to the large proportion of instances in which either no improvement resulted from the operation or a relapse into the previous state occurred. These unfavourable results were due to two causes—defective methods of fixing the kidney, and having recourse to operation in unsuitable cases.

With the introduction of more perfect methods of operating, and a judicious selection of cases suitable for the operation, brilliant results have been obtained in a large proportion of cases. Still, the operation must be regarded as the least satisfactory in the whole range of renal surgery—not through the danger attaching thereto, for the mortality does not exceed more than 1 per cent., but owing to the fact that relapses are still not uncommon—as common, I should say, as after the operation for radical cure for hernia.

The present tendency in regard to the treatment of this malady may, I think, be stated thus :

When a movable kidney is encountered in the course of an abdominal examination for some other condition, and is unattended by any specific symptoms, no treatment is required. Indeed, the patient should on no account be informed of its existence, for when once aware of its presence there is a tendency to imagine all kinds of discomforts as arising therefrom, and to the development of hysteria.

When the neurotic symptoms are predominant in presence of movable kidney, rest in the recumbent position for five or six weeks, with general massage, careful dieting, particularly overfeeding with large quantities of milk, regulation of the bowels, and all that constitutes the Weir-Mitchell treatment should be employed. This will not fix the kidney in position, but the neurotic symptoms will probably disappear, and the patient forget the existence of the movable kidney.

When the condition is merely part of a general enterop-

tosis, an abdominal belt should be worn to support the abdominal viscera.

In other cases, where the symptoms are not severe, a carefully adjusted pad supported by a truss should be worn. The pad should be scallop-shell shaped, consisting of a light metal frame carefully covered, and so adjusted by the truss that the kidney is grasped by its concave surface and pushed upwards and outwards to keep it in the proper position.

In a considerable proportion of cases one or other of these measures will greatly ameliorate the symptoms, though in few, if any, can a complete cure be expected therefrom.

Operation should only be had recourse to—(1) when the ameliorative measures already referred to fail to give relief; (2) when renal colic is a predominant symptom: in such cases it is useless to attempt ameliorative measures; (3) when the case is complicated by intermittent hydronephrosis; (4) when there is interference with the renal circulation through the pedicle; and (5) when the kidney, in addition to being movable, is the seat of stone or growth.

When the condition is part of a general enteroptosis, operation is useless and should not be had recourse to.

The operation, which is termed ‘nephrorrhaphy’ or ‘nephropexy,’ consists in placing the kidney in its natural position and fixing it there.

The kidney, enclosed in its fatty envelope, is exposed in the manner already described in the operation of nephrolithotomy. The perinephric fat is then opened and completely removed from the outer and posterior aspects of the organ, so that nothing shall intervene between the kidney and the transversalis fascia when the gland is fixed in position. Before attempting to fix the kidney it should be withdrawn through the wound on to the loin, and a methodical examination of it made to ascertain if it be the seat of disease, such as calculus or growth.

The renal pelvis and upper end of the ureter should also be examined, to ascertain if stricture, kink, or abnormal attachment of the latter exists.

Various methods of attempting to fix the kidney to the abdominal wall have been devised by different surgeons. Two only will be described, as being practical and efficient.

1. *Suturing the Kidney to the Abdominal Wall without Removal of the True Capsule.*—Whilst the kidney is exposed on the loin three stout catgut sutures are inserted deeply into its substance by means of a large blunt curved needle—one near the upper pole, one near the lower pole, and the third in the middle of the kidney. In each case the true capsule is perforated well back on the outer aspect of the gland, but quite free of its pelvis, and the needle is made to underrun the capsule $\frac{1}{2}$ inch deep in the substance of the kidney, emerging about 2 inches from its entrance on the inner aspect of the convex margin of the gland. The needle is withdrawn, leaving the sutures behind. The kidney is now returned through the wound, care being taken that it is not twisted on its pedicle. One end of the upper suture is threaded in the needle, which is made to transfix the transversalis fascia and abdominal muscles from within outwards, close under the lower margin of the last rib. The other end of the suture is passed in a similar manner at a distance of an inch or so from the former. The ends of the lower suture are passed in a similar manner through the transversalis fascia and muscles on the lower edge of the wound. One end of the middle suture is passed through the fascia and muscles at the middle of the upper margin, and one through the lower margin of the wound. The sutures are now in position, ready for tying. Before this is accomplished the edges of the abdominal wound are brought together throughout by means of a series of catgut sutures. The kidney is now pushed well up towards the wound by the hands of an

assistant placed on the abdominal wall in front, and the ends of the upper kidney suture tied, but not too tightly, lest it cut through the substance of the gland. Similarly the ends of the other two sutures are tied. The kidney is thus held in position with its true capsule in contact with the transversalis fascia for a sufficient time to allow inflammatory adhesion to take place.

It will be observed that the kidney sutures are not tied till the muscles are brought together by sutures. In this manner difficulty in bringing these muscles together, as well as injurious traction on the kidney, are obviated.

Finally, the edges of the skin are brought together by silkworm gut sutures.

By this method satisfactory union between the true capsule of the kidney and abdominal wall is, as a rule, effected.

2. *Fixation of the Kidney after Partial Removal of its True Capsule.*—In recent years the practice has grown up of removing a portion of the true capsule, so as to bring the raw surface of the cortex in contact with the transversalis fascia, and thus assure more certain adhesion between the opposed surfaces.

The capsule may be raised off the cortex by making a vertical incision 3 or 4 inches long through it along the outer aspect of the gland, and incisions each 2 inches long at right angles to this at its ends. An anterior and a posterior flap of capsule are then raised off the kidney by inserting the handle of a scalpel between the cortex and the capsule. Some surgeons prefer raising the flap by means of a crucial incision through the capsule. The shape of the flap is immaterial, provided a sufficiently large raw surface of the cortex is exposed. The angles of the flap are sutured by catgut to the transversalis fascia and abdominal muscles in a similar manner to that already described for fixing the undecapsulated kidney.

No drainage-tube is, as a rule, required, the skin and muscles being brought together along the entire length of the wound. The dressings need not be changed for a week if all goes well.

The patient should keep the recumbent position for six weeks in order to permit of firm adhesion of the kidney to the transversalis fascia, after which an abdominal belt should be worn for a further period of two or three months, when the belt may be dispensed with; but the patient should be warned not to lift weights or make any violent exertion for six months after operation.

Should the kidney again become loose and severe symptoms recur, the question will arise as to whether a second attempt should be made to anchor it or nephrectomy be had recourse to. Each case must be decided on its merits, particularly with reference to the state of the other kidney.

LECTURE XXIV

HYDRONEPHROSIS PYONEPHROSIS

ATTENTION has already been directed to the fact that when there is continued obstruction to the flow of urine in any part of its tract, there is a tendency for that portion of the channel lying behind the obstruction to become gradually dilated.

In this way we have seen that in presence of stricture of the urethra or enlargement of the prostate the bladder may become enormously dilated, with thin-walled pouches protruding outwards between the muscular bundles.

Similarly, by the accumulation of urine within them, due to backward pressure caused by obstruction, the renal pelvis and calyces may become gradually dilated, till eventually the renal tissue becomes atrophied and converted into a multilocular sac.

To this condition, when the contained fluid is sterile urine, the term *hydronephrosis* is applied. When suppuration supervenes, or the urine from the beginning has been septic, *pyonephrosis* is the term employed.

Though these two diseases differ widely in many respects, the former being non-inflammatory throughout its course and the latter inflammatory, they have many points of similarity both in origin and treatment, so that it will be convenient to consider them together.

The condition of the ureter in either disease will depend

on the seat of the obstruction. If this be situated at the junction of the renal pelvis and ureter, this duct will be unaffected; if at the lower part of the ureter, or in any part of the urinary tract below this position, the ureter will also be involved in the dilatation.

I. Hydronephrosis.

The hydronephrosis may be limited to one side only or extend to both. When the obstruction is situated in the urethra or at the neck of the bladder, the disease will be *bilateral*; when at the vesical end of the ureter, or at any position in the course of that canal, it will be *unilateral*.

For the production of hydronephrosis the obstruction must be incomplete or intermittent. Complete obstruction, if long continued, results in atrophy of the kidney rather than dilatation.

The causes of bilateral hydronephrosis are:

1. Stricture of the urethra.
2. Impacted calculus of the urethra.
3. Enlargement of the prostate.
4. Vesical calculus partially lodged in the prostatic portion of the urethra.
5. Tumours of the pelvic organs, particularly cancer of the uterus and impacted uterine and cervical fibroids, causing obstruction at the neck of the bladder.

It is a remarkable fact that in some of the most aggravated forms of hydronephrosis it is impossible to ascertain the cause; but this may be due to a previously existing cause having disappeared, as, for instance, when an impacted ureteral calculus passes down into the bladder and escapes *per urethram*.

The causes of unilateral hydronephrosis are:

1. Calculus of the renal pelvis, blocking the entrance to the ureter.

2. Impacted calculus of the ureter.
3. Tumours of the bladder, involving the vesical orifice of the ureter and pressing thereon.
4. Contraction of the vesico-ureteral orifice, following cystitis and ulceration.
5. Kinking of the ureter from rotation of a movable kidney.
6. Valvular obstruction at the junction of the ureter and renal pelvis, generally of congenital origin.
7. Congenital narrowing or 'inadequacy' of the ureter.
8. Stricture of the ureter.
9. Tumours of the pelvis or abdominal organs pressing on the ureter.
10. Enlarged and indurated lymphatic glands pressing on the ureter.

Hydronephrosis is occasionally found in children at birth, and the renal distension may have advanced to such a degree that embryotomy is necessary to allow of delivery of the foetus.

The ascertained causes in this condition of the foetus are imperforate urethra, imperforate hymen, and torsion of the penis.

The backward pressure of the urine accumulating above the obstruction distends the renal pelvis and calyces, flattens and wastes the pyramids, and causes atrophy of the medulla and cortex, till eventually in extreme cases of hydronephrosis the kidney substance will have practically disappeared, the pelvis and calyces being converted into a multilocular cyst, the walls of which will be formed partly by the dilated pelvis and mainly by the fibrous capsule of the kidney, lined by a parchment-like layer of condensed cortex (Fig. 140).

Rarely, however, do we encounter such extreme cases. As a rule, more or less of the medulla and cortex remain, forming dense septa between the loculi.

In other cases the dilatation is almost entirely limited to the renal pelvis, which bulges out in the form of an enormous globular or balloon-like appendage to the kidney, which

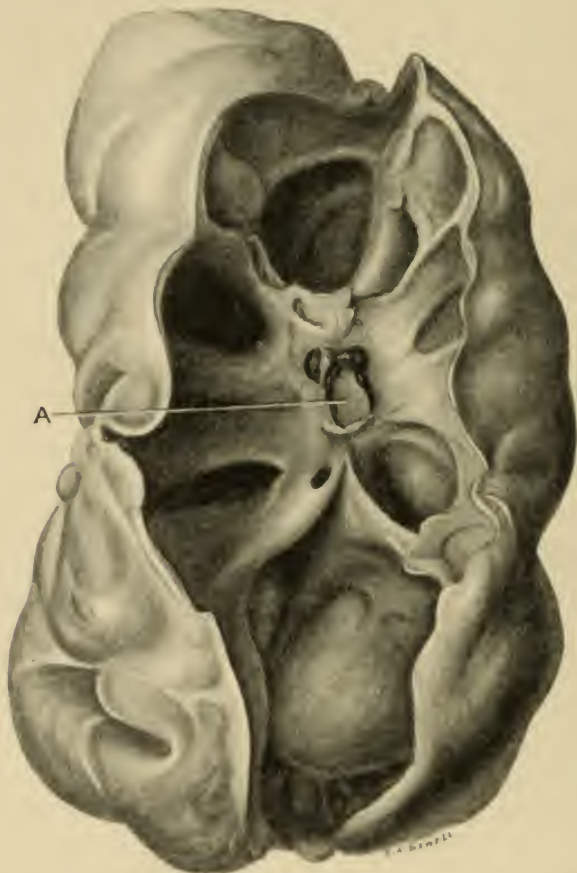


FIG. 140.—HYDRONEPHROTIC KIDNEY, PRODUCED BY BLOCKAGE OF UPPER END OF URETER BY CALCULUS, A.

is little altered save that its tissues are more dense than usual.

The ureter may be dilated to such an extent as to resemble

the small, and in some cases even the large, intestine. It will be unequally dilated in different parts of its extent, the most contracted portions of the lumen being at the vesical and renal orifices. In cases of obstruction of long standing due to enlarged prostate I have found the vesical orifices of the ureters dilated to such an extent that the forefinger passed readily into them.

As long as any of the secreting tissue of the kidney remains the hydronephrotic fluid differs little from normal urine, except that the urea is deficient and the specific gravity lowered. When the renal tissue has entirely disappeared the fluid will consist merely of water containing chloride of sodium in solution, without a trace of urea or uric acid.

The quantity of fluid present varies from a few ounces to several quarts.

In cases of horseshoe kidney one-half of the organ may be found sacculated, corresponding to the obstructed ureter. Similarly, when a kidney is furnished with two ureters, one of which becomes obstructed, the portion of the organ drained by that ureter will be sacculated, the portion drained by the free ureter remaining unaltered.

The disease may occur at any age, and, as already stated, may be antenatal. It occurs more frequently in females than in males.

Symptoms.—Hydronephrosis is an extremely insidious disease, the condition frequently existing for years and gradually increasing before being recognized. This is particularly the case with the bilateral variety, the only early symptom that may arouse suspicion being the secretion of pale urine of low specific gravity, on the occurrence of which an examination of the loins may reveal enlargement of the kidneys. Frequently the first indications of this condition are uræmic in character—viz., nausea, vomiting, dry tongue,

dry skin, thirst, and headache. I find that these latter symptoms are not uncommon in connexion with enlargement of the prostate of long standing with over-distension of the bladder. In such cases the bladder should be drained suprapubically for a fortnight or so, to enable the kidneys to regain their normal secreting functions, before enucleating the prostate.

In unilateral forms the first indication of the disease will frequently be the presence of a tumour in the loin, renal in character, of rounded outline, lobular, and fluctuating on palpation. This tumour may attain such a size as to extend across the middle line of the abdomen, and by pressure may cause disturbance of the heart and lungs.

The disease frequently assumes an intermittent character, a swelling in the loin of the type above described being recognizable at times and absent at others. This variety is generally attended by a feeling of fullness and discomfort in the loin. At its climax there will be pain in the loin and abdomen, which may be intense in character, with nausea, vomiting, dry tongue, and thirst. On subsidence of the swelling there will be a profuse discharge of urine, light in colour and of low specific gravity, and all the symptoms will disappear, to reappear, however, on the reaccumulation of the fluid.

The intermittent form is usually found in connexion with movable kidney, valvular obstruction, and ureteral calculus.

Hæmaturia is an occasional, though very rare, symptom.

Termination.—In a small proportion of cases the hydronephrosis subsides permanently by the disappearance of the cause, such as the passage of a calculus, or a renal twist righting itself. One of the dangers attached to this condition is the possibility of the sac rupturing into the abdomen and causing peritonitis.

Diagnosis.—The chief conditions with which the disease may be confounded are: hydatids of the liver, cystic dilatation of the gall-bladder, ovarian cysts, and localized ascites.

Catheterization of the ureter will frequently be of use in establishing a diagnosis, as also in ascertaining the site of the obstruction.

Treatment.—The treatment should in the first instance be directed to the removal of the cause, if this be possible. In the bilateral variety depending on enlarged prostate or stricture of the urethra the hydronephrosis will entirely disappear on the successful removal of the obstruction.

Massage, aspiration of the tumour, and tapping by trocar and cannula, have been employed in cases of unilateral hydronephrosis, and in certain instances these methods have been followed by permanent disappearance of the tumour; but in the greater number they have been unsuccessful, and occasionally disastrous results have followed. These methods are now regarded as uncertain and even dangerous.

The only judicious treatment in cases of persistent unilateral hydronephrosis consists in performing an exploratory operation (nephrotomy) by the lumbar route, and ascertaining the cause of the disease.

If this be a movable kidney nephrorrhaphy should be undertaken in the first instance; should this fail, nephrectomy must subsequently be done.

If a calculus lodged in the renal pelvis or ureter or stricture of the ureter be the cause, these conditions should be dealt with as already indicated (Lectures XX., XXI.), and their removal will effect a cure.

If the cause of the disease be not apparent, our procedure will depend on the condition of the opposite kidney and the quantity of secreting substance remaining in the hydro-nephrotic one. If the secreting tissue be entirely destroyed,

nephrectomy should be forthwith performed, for it is obvious that the renal functions are already carried on by the other kidney.

If, however, in the affected kidney a certain amount of secreting parenchyma remains, it will be advisable in the first instance to drain the kidney and establish a fistula for a time—particularly as there are instances on record in which after this procedure the obstruction has spontaneously disappeared, the flow of urine through the ureter being established and the fistula permanently closed.

Should, however, a permanent fistula remain, it will generally be advisable to perform a secondary nephrectomy, provided it is found that the second kidney is sound.

II. Pyonephrosis.

There are three different ways in which this condition may originate :

1. A previously existing hydronephrosis may suppurate at any period in its history, when it becomes a pyonephrosis. The infection may ascend along the ureter from a suppurative centre lower down in the urinary tract, or it may be transmitted through the bloodvessels or lymphatics.

2. The suppuration and dilatation may commence and progress simultaneously, as the result of obstruction low down in the urinary tract, attended by infection of the urine. Cystitis, resulting from stagnant urine, due to enlarged prostate or stricture of the urethra, is the most common precursor of this form of the disease.

3. It may originate in pyelitis, the obstruction to the flow of urine being due to thick muco-pus, blood-clot, calculus, tuberculous matter, or fragments of disorganized tissue from renal cancer, blocking the ureter.

It will thus appear that the primary causes of this disease include not only all those already enumerated as favouring

the production of hydronephrosis, but also those inducing pyelitis.

Calculous pyelitis is the most common cause. Next comes, perhaps, tuberculosis of the kidney. And, as in the case of hydronephrosis, the cause is sometimes not apparent.

A kidney affected by this disease is almost invariably enlarged, lobulated, and congested, with greyish-yellow mottling on its surface, most marked at the prominent portions of the lobules, and due to their purulent contents being visible through the thinned renal tissue. Fluctuation will be detected in the separate lobules, or in the kidney as a whole. The gland will be converted into a multilocular cyst, containing pus of varying consistence, the loculi being separated from each other by fibrous septa, but all communicating with the dilated pelvis. In advanced cases the septa are destroyed, the kidney being converted into a mere bag of pus. The inner surface of the cyst may be smooth; more frequently it is rough, covered by shreddy false membrane, easily detachable therefrom.

In the unilateral form of the disease the ureter will be involved when the obstruction is low down. Both ureters will be involved in the bilateral form, due to obstruction in the urethra or prostate.

The contents of a pyonephrotic kidney vary, and may consist of—(1) urine containing a small quantity of pus; (2) concentrated pus, with little urine; (3) urine, pus, and blood; (4) putty-like material, particularly in cases due to tuberculosis; (5) pus mixed with phosphatic grit of mortar-like consistence; or (6) any of these in conjunction with calculus.

The calculus may be *primary* (uric or oxalate), the cause of the disease; or *secondary* (phosphatic), resulting from the disease; or both the primary and secondary forms may coexist.

In advanced stages of the disease perinephritis may supervene, the fatty capsule being dense and very adherent to the kidney, or pus may intervene between the two. Adhesion to the bowel and abdominal viscera may take place eventually.

Symptoms.—When the disease is fully developed, there will be a tumour in the loin presenting the characteristics already described in connexion with hydronephrosis, but attended by more pain, and there will almost invariably be distinct tenderness in the loin on palpation.

Concurrently with the existence of this tumour the urine will contain pus, constantly as a rule, but sometimes intermittently. If one kidney be sound, and the ureter of the affected kidney get temporarily blocked, the urine passed will be devoid of pus for a time, to be followed by a profuse discharge of pus in the urine on the blockage being removed.

During the temporary blockage of the ureter there will be increased swelling in the loin, and the pain and tenderness will be much increased, all of which symptoms will subside or become less acute with the free discharge of pus in the urine.

As a rule, there will be pyrexia during the blockage of the ureter, which will subside on the reappearance of pus in the urine; but in slowly advancing cases I have known pyrexia to be absent throughout the whole course of the disease. In other instances, particularly when pyelonephritis complicates the case, there will be almost continuous pyrexia, the temperature, as a rule, rising to its highest at night, and then there will be dryness of the tongue, thirst, headache, rigors, loss of appetite, and gradual wasting.

Premonitory to the development of the characteristic symptoms of the disease, those appertaining to its cause will have been noticed—for instance, those of enlargement

of the prostate or stricture of the urethra—and probably cystitis, as a consequence of these conditions, will have set in, and existed for some time before the symptoms of pyonephrosis begin to reveal themselves. Similarly, when due to renal calculus or tuberculosis, the symptoms of these diseases will have shown themselves for some time previously.

The cystoscope is of much value in diagnosis, for by it we can frequently see the pus issuing from the ureteral orifice on the affected side.

Still more useful in this respect is catheterization of the ureters, for by this means we can definitely ascertain which of the kidneys the pus comes from, or if from both; and coincidentally we can ascertain by the nature of the urine thus drawn off if one kidney is sound, a matter of vital importance in surgical interference with the diseased organ.

The older text-books laid stress on the condition of the urine—whether acid or alkaline—as being of much diagnostic importance, pus mixed with an acid urine being regarded as of renal origin, and pus suspended in an alkaline urine as of vesical origin. Broadly speaking, there is considerable force in this distinction; but it must be remembered that stagnant urine in the renal pelvis and calyces may decompose, in which case the urine from this source would be alkaline.

Treatment.—This should be in the first instance directed to the removal of the cause. Should the accomplishment of this be practicable, and the disease not have advanced to such a degree as to cause irreparable injury to the kidney, the organ may be expected to regain its normal condition in course of time.

In the bilateral form of the disease due to enlarged prostate or stricture of the urethra I am constantly verifying the truth of this statement.

A not uncommon cause of unilateral pyonephrosis is impaction of a calculus at the vesical orifice of the ureter. I have in several instances, some of which have been recorded (p. 362), removed the calculus through a suprapubic cystotomy, with complete cure of the disease.

When in the unilateral form of the disease the source of the obstruction lies higher up in the ureter or in the kidney, and the symptoms are pronounced, the proper treatment consists in exploring the kidney through the lumbar route, and then proceeding in accordance with the conditions found.

If the secreting tissue of the organ be completely destroyed, and it be known that the other gland is sound, nephrectomy should be performed forthwith, no matter what the cause of the disease may be.

Even when the kidney is only partially destroyed, and tuberculosis is the source of the disease, nephrectomy should be had recourse to, for any measure short of this will leave a tuberculous focus behind, which will probably light up the disease in the ureter and perinephric tissues.

In other cases in which an appreciable portion of the secreting tissue still remains, particularly when calculus is the cause of the disease, it will be advisable to rest content with the nephrotomy (and removal of the stone, if there be one, =nephrolithotomy), in the first instance at any rate, the pus being freely evacuated through an incision in the kidney. The septa between separate pus cavities should be broken down by the finger, so as to make them communicate with one another; and they should be freely flushed out with an antiseptic lotion to remove all the septic material. A drainage-tube should then be inserted into the renal cavity for a few days, and daily irrigation had recourse to whilst pus issues from the wound. It may be advisable in some cases to stitch the kidney to the edges

of the wound to prevent its falling away from the drainage-tube.

In a large proportion of cases of this nature the lumbar wound will close, and a useful quantity of secreting renal tissue remain. Should a permanent renal fistula ensue, a secondary nephrectomy can be undertaken.

Washing out the pelvis of the kidney through a catheter introduced through the ureter has been advocated; but the daily catheterization of the ureter is a very troublesome procedure, not at all devoid of danger, and can scarcely be regarded as coming within the bounds of practical surgery.

In certain cases, as in aged patients, or when there is some coexisting condition that renders an operation dangerous, palliative treatment may have to be adopted. And this may be permissible in the early stages of the disease, even when no such adverse circumstances exist, provided the pus is freely evacuated with the urine, there is no pyrexia, and the symptoms in general are not urgent.

This consists of rest in bed or on a couch, warm baths, the application of emollient liniments to the loin, avoidance of constipation, total abstinence from alcohol, a restricted diet, consisting of fish, game, chicken, milk, and vegetables, butchers' meat being avoided.

Antiseptic drugs, such as urotropin, hetraline, cystamine, salol, boric acid, and benzoic acid, in conjunction with bland drinks, such as barley water and decoction of triticum, should be administered, with a view to affect the pathogenic organisms in the urine, and thus reduce or get rid of the pus.

An occasional course of Contrexéville water will also prove beneficial.

Nephrotomy.

Nephrotomy is the term applied to an operation involving exposure of, and incision into, the kidney. The preliminary

steps of the operation, which is always undertaken through the lumbar route, are identical with those already described in connexion with the operation of nephrolithotomy (p. 349).

The conditions that may require this procedure are: (1) hydronephrosis, (2) pyonephrosis, (3) abscess of the kidney, (4) renal cysts, (5) calculus anuria, (6) growths of the renal pelvis, and (7) renal tuberculosis.

It is most frequently undertaken as an exploratory operation for conditions of the kidney not admitting of definite diagnosis beforehand. The nature and extent of the incision in the kidney will depend on the condition found on exposure of the gland.

LECTURE XXV

TUBERCULOSIS OF THE URINARY ORGANS

I.

Tuberculosis of the Bladder.

ILLUSTRATIVE CASE.—This is a male patient, aged twenty-nine, a glass-blower by occupation, who has for three years, off and on, suffered from hæmaturia, which was the earliest symptom noticed. The hæmaturia was slight at first, the urine being merely tinged with blood for two or three days at a time, with intervals of weeks or months, during which his water was quite clear. During the last three months, however, he has had seven or eight attacks of rather profuse bleeding, the urine being coloured bright red, and clots of blood being expelled. At the end of micturition a few drops of pure bright blood are passed. These attacks occur at periods of a week or ten days, the urine clearing up in the intervals. Exercise does not seem to aggravate this symptom; indeed, it occurs usually on getting out of bed in the morning.

Some months after the hæmaturia set in he began to be troubled by increased frequency of micturition, which has gradually grown worse, till he now passes urine every half-hour or so by day, and has to get out of bed seven or eight times at night.

The flow of urine is intermittent—that is to say, after the patient has passed an ounce or two the stream stops involuntarily, to go on again after a few minutes, this phenomenon repeating itself several times before the bladder is completely emptied. At the termination of micturition there is much straining, to get rid of an imaginary residue.

Micturition is accompanied by pain, which is present before, during, and for a few minutes after the act. This pain is most severe at the end of the penis behind the glans, like the pain attending stone in the bladder; but there is also an undefined pain, or rather sense of scalding, along the urethra, in the perineum, and even in the anus. Before the act of micturition, when the bladder is at all distended, there is a dull

aching pain above the pubes. The pain did not set in for about a year after the commencement of the hæmaturia, which was at first of a painless character.

The urine is at present faintly alkaline, almost neutral, slightly turbid, containing a little pus and mucus, which give it a flocculent appearance, and do not readily fall to the bottom of the glass. On settling down after some hours, the deposit forms a thick, tenacious mass, which does not disperse when the vessel is shaken, but moves about in an irregular globular mass. I particularly invite your attention to these features, which are very characteristic of tuberculous urine. The specific gravity is 1022; albumin is, of course, present from the pus, but there are no blood-corpuscles visible at present. The urine has been examined for tubercle bacilli, but none have at present been discovered. (Tubercle bacilli were subsequently recognized.)

The patient's father and mother died of consumption, but he has seven brothers and sisters all alive and apparently in good health. He himself is pale and thin, and latterly has been losing flesh, but he has no cough, and there is no evidence of tubercle outside of the bladder. There are no indications of tubercle in the genital organs—testes, epididymes, vesiculæ seminales, and prostate; and there is no pain, tenderness, or enlargement of the kidneys.

I sounded the patient, but could detect no stone. I then made a cystoscopic examination under an anæsthetic, and found that there were two small ulcers of the bladder, $\frac{1}{2}$ inch apart, situated about 1 inch behind the right ureteral orifice. One of these ulcers is slightly larger than the other, the larger being $\frac{1}{8}$ inch in diameter, but otherwise they resemble each other in all respects. They are irregularly rounded, depressed below the general surface, as if a piece had been punched out of the mucous membrane. The bases of the ulcers are not visible, being covered with glistening white phosphatic deposit. The edges are raised and coloured red by blood-pigment, outside which is a narrow, pale, anæmic zone; and beyond this the ulcers seem to be set in swollen, congested, dark red mucous membrane, which gradually fades away into the pale healthy surface of the bladder beyond. The ureteral orifices are normal in appearance, and there is no other trace of disease in his bladder.

This, then, is a typical case of *primary* tuberculosis of the bladder. I have brought the patient here to-day, in order that you may have an opportunity of seeing an example of an extremely rare form of tuberculous disease; and I hope to be able to demonstrate to you later on the cystoscopic appearances as the case progresses. The case, besides,

offers a convenient opportunity of making some remarks on tuberculosis of the bladder and urinary organs generally.

It is now recognized that tuberculosis of the bladder is a much more common disease than was imagined some years ago. This recognition of its comparative frequency we owe mainly to the introduction and extended use of the cystoscope and to bacteriological research, as aids to diagnosis.

Tuberculosis of the bladder may occur as a *primary* disease of that viscus, when no evidence of its existence can be found in any other organ; or it may invade the bladder from some pre-existing tuberculous focus or foci, in which case the disease is termed *secondary*. The former type of invasion is extremely rare in comparison with the latter, and is probably due to the tubercle bacillus circulating in the blood-stream locating itself in the tissues of the bladder.

Primary tuberculosis may begin in any part of the bladder, but it is most frequently seen by the cystoscope in its earliest stages on the posterior aspect of the viscus, behind the inter-ureteral bar.

When the bladder is attacked secondarily to the existence of tubercle in some organ outside the genito-urinary tract, the disease follows the same laws of invasion as to locality as in primary tuberculosis of that viscus.

But in the vast majority of cases, tuberculosis of the bladder occurs secondarily to some pre-existing focus in the kidney or genital apparatus—namely, the testicle, epididymis, vesicula seminalis, or prostate. In the former variety, termed the *descending* type, the bladder is first invaded around the orifice of the corresponding ureter; whilst in the latter, termed *ascending*, the tuberculous disease shows itself at the neck of the bladder and in the trigone. Writers differ widely in their views as to which of these two sources of invasion is most common. My own experience would

lead me to believe that they are about equally common in the adult male; but that in male children the descending form of tuberculosis of the bladder is most frequent. Tuberculosis of the bladder is found much more commonly in the male than in the female.

There are several different routes by which tubercle can be conveyed secondarily to the bladder: (1) Through the blood. (2) By the lymphatics. (3) By extension, through continuity of surface, along the mucous membrane from the kidney or genital organs. This is by far the most common form of invasion. (4) By direct ulceration from the prostate into the bladder. (5) By infection, from the kidney, through the urine. It is a remarkable fact that tuberculous disease of the kidney may exist for years without the bladder getting secondarily infected, though bathed with pus conveyed from the former source. The mucous membrane of the bladder would therefore appear to possess considerable powers of resistance against the tubercle bacillus. Indeed, it is probable that congestion, inflammation, or abrasion of the mucous membrane is essential to render it amenable to attack in this way.

The first stage in tuberculous invasion of the bladder, as seen by the cystoscope, consists in infiltration of the mucous and submucous tissues, the mucous membrane being swollen and raised in irregular patches, presenting a highly congested or inflamed, dull red appearance, which gradually fades away into the healthy lining of the bladder. Small greyish nodules soon appear in these patches, which in course of time degenerate into cheesy matter. Their contents soften down, and, together with the mucous membrane covering them, necrose, and are cast off, leaving behind ulcers, with the characteristic features already described as existing in this patient. The ulcers, at first isolated, have a tendency to coalesce, forming irregular ragged patches, with raised margins. The mucous

membrane around is inflamed, and fresh tuberculous nodules may be seen by the cystoscope springing up in it. The mucous membrane frequently displays small villousities, and may be elevated into nodular eminences, some of them as large as the tips of one's fingers, presenting the appearance of small sessile papillomata. As the disease progresses the whole surface may be flecked with blood-pigment, shreds of muco-pus, and phosphatic crusts, which cling to it so tenaciously that they cannot be removed by repeated washings through a catheter. Small phosphatic calculi, secondarily formed, are not infrequently found.

Dissemination of the tubercle takes place rapidly if the bladder becomes infected by pus microbes, induced by the introduction of septic instruments, or otherwise.

As a rule, the tuberculous ulcers are shallow, but they sometimes extend to the muscular layer, and even eat their way through the whole thickness of the bladder wall, fistulæ remaining, or into the perivesical tissues, urinary abscesses forming and making their way to the surface in the groins or perineum. This, however, is a rare occurrence. In advanced stages of the disease the walls of the bladder may become greatly thickened, and its cavity extremely contracted, and perhaps pouched.

Tuberculosis of the bladder is most common between the ages of puberty and thirty-five years. I have, however, seen many instances of this disease in children of from eight to fifteen years.

The symptoms present in the case under consideration and their leading features are fairly typical of those generally attending tuberculosis of the bladder. You will observe that they are nearly allied to those of stone. Indeed, there are no two diseases of the bladder the symptoms of which so closely resemble each other as stone and tubercle; and, as a rule, a diagnosis can only be effected by sounding or

cystoscopic examination, or both. When tubercle bacilli are found in the urine, they are pathognomonic of tuberculous disease in some part of the urinary tract, but repeated examination of the urine may be necessary before the bacillus is found.

Hæmaturia, as in this case, is not infrequently the earliest symptom. It may exist for months before pain and increased frequency of micturition supervene. As a rule, it is slight, the urine being faintly tinged with blood; but when even slight ulceration takes place, it may be profuse, with passage of large clots. Indeed, on cystoscopic examination, one is frequently puzzled at the apparently trivial lesions found in presence of profuse hæmorrhage. One of the earliest symptoms of tubercle of the bladder is the painless passage of a few drops of pure blood at the end of micturition.

The hæmaturia, of whatever variety, is at first intermittent, lasting from one to three days, the urine then clearing up, and another attack not occurring for weeks or months. As the ulceration extends, the attacks of hæmorrhage become more frequent and pronounced, and eventually blood is constantly present in the urine. It will be found that the painless hæmaturia occurs when the ulceration is situated at a distance from the neck of the bladder. Once the trigone is invaded, pain and increased frequency of micturition are invariably present. The hæmorrhage is rarely so profuse as when resulting from a growth in the bladder. That from stone is invariably attended by pain, and is always aggravated by exercise, by which the hæmorrhage of tubercle is, as a rule, uninfluenced.

One of the most characteristic features of tuberculosis of the bladder is the readiness with which hæmorrhage from the ulcers takes place on the slightest overdistension of the viscus with fluid. Consequently, in making a cystoscopic

examination in cases in which tuberculosis is suspected, great care should be taken not to overdistend the bladder, otherwise the examination will be rendered nugatory through the fluid medium being opaque with blood.

Increased frequency of micturition and pain are usually the initial symptoms. It is characteristic of tuberculosis that they are, as a rule, uninfluenced by exercise. Indeed, they occur just as frequently when the patient is lying down as when he is going about. In advanced stages of the disease there is an almost constant desire to micturate, accompanied by straining to expel an imaginary residue of urine.

The pain in the earliest stages of the disease is present only with the acts of micturition, and is frequently felt near the end of the penis behind the glans, but it is never, as in stone, confined to this region. It is of a burning or scalding character, and extends along the whole urethral canal. When the ulceration is extensive, pain is constant in the hypogastric region, but it is much enhanced when the bladder is at all disturbed. The supervention of general cystitis aggravates both this and the previous symptoms.

It is difficult to account for the intermittency of the flow of urine in the case before us. It is, I presume, due either to reflex spasm or to an intuitive desire to avoid the pain consequent on the raw ulcers on the posterior and upper part of the bladder coming in contact with its neck when the viscus is empty. When the disease invades the trigone and neck of the bladder, intermittency is caused by the turgescence of these parts.

Incontinence of urine is not an uncommon symptom of this disease in children, and particularly in females; it indicates, as a rule, that the neck of the bladder is involved.

As with tuberculosis of other organs, loss of weight is an early symptom, and eventually general emaciation takes

place. Fever may also occur, particularly should general cystitis supervene.

The prognosis in this disease is always grave, even when, as in the case under consideration, the ulceration is limited in extent. The tubercle has a tendency slowly, but irresistibly, to invade the adjacent mucous membrane, or to appear in isolated patches at a distance from the scene of its original invasion, the ulceration thus gradually extending. The advent of general cystitis adds greatly to the gravity of the disease.

What is the treatment indicated in the case before us? In all cases of tuberculosis of the bladder general hygienic and medical treatment is of the utmost importance, and in its early stages this alone, without the aid of local measures, is frequently sufficient to arrest its progress and enable the patient to throw off the disease. Treat the case on general principles, as if it were one of tubercle of the lungs or other organ. There are cases on record, and I have seen such in my own practice, in which patients suffering from tubercle of the bladder have completely recovered: and I consider that, in this case, the disease being apparently limited, there is every prospect that under proper treatment the ulceration will be arrested and the disease eventually cast off. Cod-liver oil, iron, strychnine, carbonate of guaiacol, and other tonics, should be employed, together with a nutritious diet; and the patient should live in the open air as much as possible—a dry, bracing climate would, of course, be advisable. There is a considerable quantity of pus in the urine; consequently, urotropin will be administered in from 5 to 7 grain doses three times daily, freely diluted with water, this being the most efficient drug we possess for all forms of pyuria. Salol and boric acid are also important drugs in this disease.

Some years ago ‘instillations’ of iodoform emulsion came much into vogue, 1 ounce of a 5 to 10 per cent. solution of

iodoform in glycerine and mucilage being injected daily, and allowed to remain after washing out the bladder with boric acid or weak permanganate of potash solution. The results of this treatment, though vaunted at the time, have, by experience and closer examination, proved to be not very encouraging.

Injections of weak solutions of nitrite of silver constitute our sheet-anchor in ordinary cystitis; but this drug has been found to be not only useless, but actually injurious in tubercular cystitis.

The drug that has been found most efficacious for injections in this disease is corrosive sublimate, commencing with a strength of 1 in 10,000 in water, and gradually increasing it to 1 in 2,000. Pass a soft catheter and draw off the urine, and inject $1\frac{1}{2}$ to 2 ounces of the warm solution, which is at once allowed to flow off. Repeat this process three or four times. Before withdrawing the catheter, inject $\frac{1}{2}$ to 2 drachms of this solution, which is allowed to remain in the bladder. The most scrupulous care must be taken that the instruments employed are thoroughly aseptic, because the bladder attacked by tubercle is particularly prone to infection, and infective cystitis in such cases is not only an agonizing but almost a hopeless condition. I do not intend to employ injections or any other local treatment in this case, in the first instance; in fact, unless under general treatment the disease increases, because the problematical benefits derived from such treatment are, in my opinion, more than counterbalanced by the danger of infection from instrumentation.

For the relief of pain in this disease, morphia and belladonna, in the form of suppository, will be found most effectual.

The final procedure we have recourse to in tuberculosis of the bladder is cystotomy, either by the perineal or the suprapubic route. The former method has now been prac-

tically abandoned, because by this route one is unable to see the extent of the disease; and, secondly, as the tubercle is, as a rule, confined to the base of the bladder, whether to the trigone or round the ureteral orifices, a tube introduced through the wound into the bladder for drainage purposes would cause great irritation. Besides, there is a danger of the tubercle extending to the wound. But the chief reason for having recourse to the suprapubic operation is, that by this route we can not only feel the extent of the ulceration in the bladder, but actually see it by means of a speculum and forehead-lamp.

Cystotomy is had recourse to for two distinct purposes. In the first place, with a view to eradicating the disease when this is of a limited character. We attempt to effect this object by thoroughly scraping the ulcers with a sharp spoon and then rubbing in iodoform paste, or by applying the actual cautery freely to the ulcer and surrounding parts. There are certain cases, undoubtedly, in which this method proves successful; but in a still larger proportion of cases it fails to arrest the progress of this disease. You may naturally suggest that, the disease being limited in the case before you, a favourable opportunity is offered for surgical interference. My reply is that experience teaches me that an operation of this kind should not be lightly undertaken, at any rate, till the general treatment already indicated has failed to arrest the disease. But, should the ulceration spread in spite of this treatment, I shall be prepared to operate.

Secondly, in very advanced stages of this disease, when the ulceration is extensive, and general cystitis and great contraction of the bladder exist, it may be necessary to perform cystotomy for drainage purposes, to relieve the terrible agony accompanying the over distension of the contracted bladder and the constant desire to micturate.

II.

Tuberculosis of the Kidney and Ureter.

Renal tuberculosis is met with in two distinct forms—the *miliary* and the *caseous*.

In the former the tubercles occur in the shape of grey or yellowish translucent granules, the size of a pin's head, scattered throughout the gland, but most numerous in the cortex in the vicinity of the capsule. Both organs are, as a rule, affected. The renal lesion is merely part of a general tuberculosis, and the infection is conveyed to the gland through the blood-stream. The disease is almost confined to childhood. It is unattended by symptoms referable to the kidney, and is not amenable to surgical treatment.

The caseous variety may occur as a *primary* disease of the kidney, or *secondary* to tuberculosis in the lower genito-urinary tract. The primary form is of most interest from a surgical point of view, as being that which presents a field for successful operative interference.

Though the primary variety of the disease may be met with at any age, it occurs mainly in early and middle adult life.

It may affect one kidney only, or exist in both. In about one-half the cases this disease is unilateral.

In this form, also, the infection is conveyed to the kidney through the blood, the tubercle bacilli penetrating through the walls of the bloodvessels into the renal parenchyma.

The disease commences, as a rule, in the bases of the pyramids, whence it spreads outwards towards the cortex and inwards to the papillæ, eventually breaking through into the calyces and renal pelvis. Greyish nodules, isolated or in groups, are found, which gradually coalesce and caseate (Fig. 141), forming rounded or irregular areas of infiltration in the deep tissues of the kidney. The caseated areas break down, forming cavities filled with soft detritus, and these

eventually coalesce, converting the kidney into a sac of putty-like matter, which may contain cholesterine or calcareous material.

The renal pelvis is eventually invaded, tuberculous pyelitis

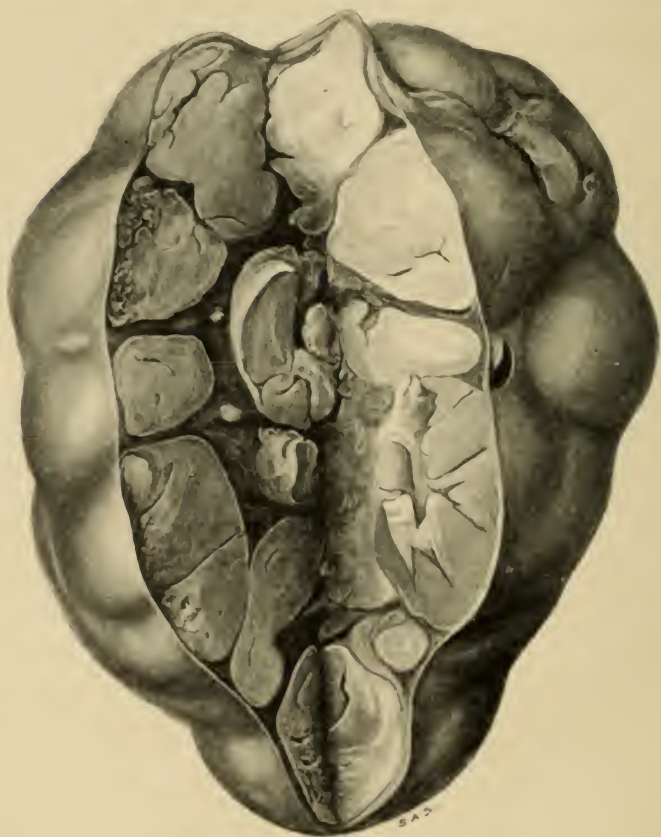


FIG. 141.—KIDNEY IN ADVANCED STAGE OF CASEOUS TUBERCULOSIS, BEFORE SUPPURATION SET IN.

resulting, and the disease spreads along the ureter and into the bladder. The ureter may be blocked by broken-down masses of caseating renal tissue, or phosphatic grit, giving rise to pyonephrosis, and in rare instances to hydronephrosis.

The tubercular abscesses may burst through the capsule and infect the perirenal tissues, giving rise to perinephritis and perinephric abscess.

When suppuration is present in the lower genito-urinary tract there is danger of secondary infection of the kidney. Under the influence of the mixed infection thus produced the disease runs a rapid course.

The kidney in this disease becomes enlarged, and is generally smooth and lobulated.

When the disease extends to the ureter its mucous lining becomes thickened and swollen, thus narrowing the lumen. Eventually the mucous membrane ulcerates, and the lumen becomes choked with putty-like material, causing hydro- or pyonephrosis. The muscular walls are also affected, so that the ureter becomes converted into a thick, dense, rigid tube, unequally dilated in its course, bulging out at parts and contracted at others, thus giving it a beaded feel.

In the ascending type the progress of the disease is reversed, the tubercular process extending upwards from the bladder by continuity along the mucous membrane of the ureter, which undergoes all those changes just described, and eventually reaches the kidney through the renal pelvis and calyces.

In this form of the disease both kidneys are, as a rule, simultaneously invaded, though generally in different degrees.

The disease may also pass along the ureteral walls through the lymphatic channels; or it may reach the kidney direct from the lower genito-urinary tract through the bloodvessels, passing over the ureter. The kidney may also be invaded by direct continuity from a tuberculous centre lying outside the urinary tract.

When one kidney is primarily affected the disease may reach the other by continuous invasion of the mucous membrane, the tubercular process descending along the ureter of

the organ first involved, invading the bladder, and then ascending along the ureter on the opposite side till it reaches the other gland.

Though the symptoms in a fully developed case of primary renal tuberculosis of the caseous type are very characteristic, the disease is, as a rule, of slow development, and may exist for a lengthened period before most of these symptoms are at all pronounced.

Increased frequency of micturition, polyuria, and pain at the termination of urination, may be the only symptoms present in the early stages of the disease. When these are encountered in a young person with a family history of tuberculosis our suspicions as to the existence of renal tuberculosis are at once aroused. These symptoms, even dysuria, may exist when the bladder is entirely free from the disease.

Pain in the loin corresponding to the affected kidney is almost invariably present as the disease advances, and may be the earliest symptom noticed. Sometimes it merely amounts to a feeling of discomfort in the loin; as a rule it is of a dull, heavy, aching character, of moderate intensity, continuous by day and night, and uninfluenced by movements or position. But in the later stages there may be violent paroxysms of renal colic, resembling those due to renal calculus, generally due to blocking of the ureter by caseous débris.

When the disease has existed some time, on examination of the loin a tumour will generally be discovered having the usual characteristics of enlarged kidney. This tumour may have developed insidiously, and be the only indication of the existence of the disease. Usually it is of moderate size, but if hydro- or pyonephrosis complicates the case the tumour may attain to large dimensions.

Palpation of the tumour is generally attended by pain and

tenderness, but never to that degree found in renal calculus. Occasionally the manipulation of the tumour is unattended by pain or tenderness.

Hæmaturia is commonly present ; indeed, it may be the first indication of the disease. Sometimes the blood is present in microscopic quantities only ; as a rule it is moderate in amount and uniformly mixed with the urine ; rarely it is so profuse and persistent as to endanger life, resembling that due to new growth of the kidney. Exercise has no influence on its production or amount, as it has in the case of renal calculus.

The urine, though clear and copious in the earlier stages, as the disease advances, and particularly when the renal pelvis and calyces are invaded, becomes scanty, and contains pus, and possibly caseous masses with renal débris. The reaction is usually acid ; but if the urine in the renal pelvis decomposes, forming phosphatic matter, it will be alkaline. The urea and phosphates are diminished in quantity in the later stages of the disease. If the ureter be temporarily blocked by débris the urine will for the time be clear, provided the other kidney be sound.

But the most characteristic symptom of the disease is the presence in the urine of the tubercle bacilli. When these are once discovered the diagnosis is definite. Their non-discovery in the urine microscopically is, however, no proof that the case is not one of tuberculosis, for frequently repeated examinations of the urine are necessary before the bacillus is recognized. In doubtful cases inoculation experiments with the urine on susceptible animals are had recourse to. In this connexion it must be remembered that the smegma bacillus may readily be mistaken for the tubercle bacillus microscopically.

Albumin will, of course, be present when pus and blood exist in the urine. Apart from this source albuminuria is

only present when nephritis or lardaceous disease of the gland coexists with tuberculosis.

Should the disease invade the bladder the symptoms of tubercular cystitis already described will coexist with the renal symptoms.

Pyrexia is frequently present in the earlier stages of this disease, and invariably so in the later. When suppuration of the kidney occurs there will be rigors, with marked evening rises of temperature, followed by exhausting sweats.

Loss of appetite, flesh, and strength, attend this disease, and progress rapidly in the later stages. There will also be sallowness of the skin, diarrhœa, and œdema of the feet and ankles.

When the ureter is involved in the disease it may possibly be felt through the abdominal wall, as a thick, indurated, nodular cord, particularly in persons emaciated from the disease.

The conditions with which the disease is likely to be confounded are: (1) renal calculus, (2) renal new growths, (3) pyonephrosis, (4) movable kidney, and (5) pyelonephritis. The characteristic symptoms of these various diseases will guide us to a diagnosis. The detection of the tubercle bacillus in the urine will definitely indicate the nature of the disease as tuberculosis.

The cystoscope is a most important aid to diagnosis in this disease, not only in differentiating it from other morbid conditions of the kidney, but also in ascertaining the extent to which the tubercular process has extended.

By it we can definitely recognize whether the bladder is healthy, or involved in the tubercular condition.

By cystoscopic examination we may actually see blood, pus, or caseous debris issuing from one or both ureteral openings, and thus conclude whether the disease is unilateral or otherwise.

In advanced renal tuberculosis, particularly when the ureter is involved, the cystoscope will frequently reveal a peculiar condition of the corresponding ureteral opening, which is placed at the bottom of a small funnel-shaped depression of the bladder with smooth or puckered margins. Through inflammatory changes the ureter loses its elasticity and becomes rigid, fixed, and shortened. This unyielding tube tugs at the mucous membrane of the bladder in the vicinity of the ureteral orifice and permanently drags it outwards, thus forming the funnel-shaped depression described. This condition is very characteristic of tubercular disease, but it is occasionally found with other inflammatory conditions of the kidney and ureter.

In tuberculosis of the kidney and ureter there may be seen an injected condition of the mucous membrane of the bladder in the immediate vicinity of the ureteral opening, without this necessarily indicating that the tubercular process has invaded the bladder. It is important in connexion with the operative treatment to recognize this, as the appearance would not contraindicate nephrectomy, other conditions being favourable.

Catheterization of the ureters will also frequently assist us in establishing a diagnosis, the urine thus drawn directly from the kidney being examined for tubercle bacillus. It will also help us in deciding whether one or both kidneys are involved. Its use in estimating the renal function has already been referred to.

In connexion with diagnosis and operative treatment it must be borne in mind that the sound organ may be larger than the diseased one, being gradually hypertrophied as it assumes the functions of both.

The general treatment of renal tuberculosis is conducted on lines similar to that for tuberculosis in any other part of the body. Miliary tuberculosis is, as already stated, not

amenable to surgical treatment; and when in the caseous variety the disease extends to both kidneys, the lower urinary tract is affected, or the condition is merely part of a widespread infection affecting parts outside the urinary organs, surgical intervention is rarely indicated, and then with an ameliorative rather than a curative design.

When it is ascertained that the tubercular disease is limited to one kidney, and that the other gland is sound, nephrectomy should be performed without delay, for the results, both immediate and remote, in such cases are most encouraging.

As a rule it will be found that the kidney is disorganized by the disease to such an extent that nothing short of complete removal of the organ will be of any avail.

If, however, the disease be very localized, and the renal pelvis and calyces uninvolved, a segment of the kidney only, embracing the tubercular centre, may be removed. Partial nephrectomy is, however, an unsatisfactory procedure, the entire kidney having frequently to be removed subsequently.

When the ureter is involved in the disease, in addition to the total nephrectomy a part or the whole of the ureter should be removed, the excision extending well beyond the disease area. As a rule the ureterectomy should be undertaken at the same time, and as an extension of the nephrectomy; but the general condition of the patient may be such as to negative such an extensive and prolonged operation, in which case the ureterectomy must be postponed to a subsequent date.

The lumbar or extraperitoneal route should invariably be chosen both for nephrectomy and ureterectomy in this disease, not only because of the much smaller mortality attending operations in this way when feasible, but also in consequence of the danger of infection of the peritoneum in operation by the transperitoneal route.

Care should be taken to prevent the tuberculous matter

coming in contact with the healthy tissues round the kidney and ureter, by isolating these organs from the neighbouring parts by sponges. The severed end of the ureter should be cauterized by pure carbolic acid.

When the perirenal tissues are involved in the disease extensive and firm adhesions may exist between the kidney and adjacent organs, rendering complete removal of the gland and its fatty capsule extremely difficult. But every effort should be made to remove the perinephric capsule in its entirety.

When, through the extension of the disease to both kidneys, the bladder being affected, or the disease coexisting in other organs outside the urinary tract, nephrectomy is inadmissible, relief of the symptoms due to tubercular pyonephrosis or pyelonephritis may be effected by nephrotomy and drainage of the abscess cavities.

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